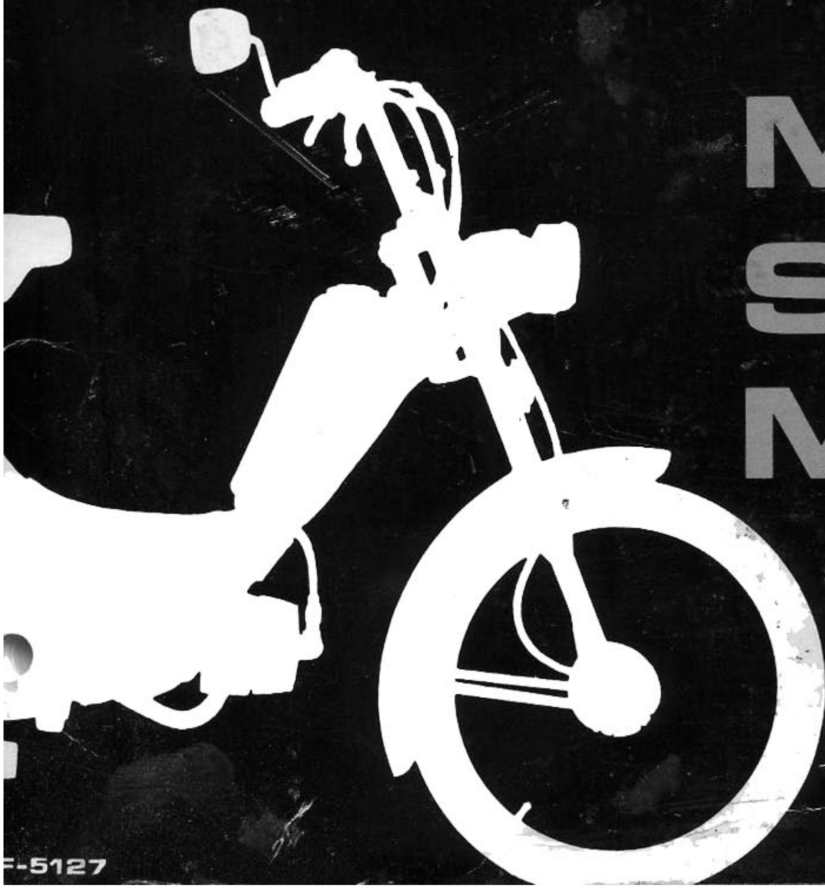
MURRAY®

Moped Service Manual



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IMPORTANT

This manual is designed and intended to assist you in providing service on models identified on the front cover. Service instructions contained in the manual are intended for professional service personnel but may also be suitable for experienced amateur mechanics with reasonable training and using proper tools. As with any Service Manual, we have not attempted in every instance to spell out all steps required. Certain basic steps such as how to loosen nuts, bolts, and screws and/or how to properly retighten parts are assumed to be basic skills of the mechanic. Also, routine safety precautions such as handling of gasoline, the need for lubrication, the need to check for function of critical parts (brakes, lights, etc.) after service work and the like are not always called out since they are assumed to be basic skills of and within the basic knowledge of the mechanic.

Companion pieces of literature to this Service Manual include the unit's Owner's Manual and Assembly Manual. You should refer to those items, be familiar with them and use them in providing unit service. It should be noted that operation of this vehicle on roadways for test rides or regular use is governed by applicable state and local laws on such items as operator age, vehicle equipment, licensing, registration, insurance and operator protective equipment. It is the service technician's responsibility to observe applicable laws. Also, this vehicle is in many states a "moped", however, it has other names or is differently classified in some states based on such criteria as engine size and speed. For convenience in this Service Manual, we have called the Vehicle a "Moped" in some instances.

SECTION I

LUBRICATION AND MAINTENANCE

LUBRICATION AND MAINTENANCE

ROUTINE MAINTENANCE SCHEDULE:

The required maintenance is clearly described in the following pages, and should be performed at the mileage intervals shown in the following chart.

LUBRICATION & MAINTENANCE CHART

	Frequency in miles				
	First	Every			
OPERATIONS TO PERFORM	300	600	900	1,800	3,600
Tire wear and condition	×	×			
Throttle cable adjustment	×		×		
Check tire pressure	×	×			
Check gearbox oil level		×			
Clean and lubricate chain	×	×			
Clean air filter			×		
Change gearbox oil	×				×
Check spark plug	×	×			
Decarbonize engine				×	
Clean Exhaust baffle				×	
Retighten screws, nuts (inc. head nuts)	×	×			
Clean fuel valve and lines					×
Clean carburetor(filter screen, float chamber)				×	
Idle speed adjustment	×			×	
Check ignition timing					×
Adjust clutch	×				×
Check brakes (linings every 900)	×	×			
Check/lubricate hub bearings					×
Steering bearing adjust/lubrication					×
Check chain tension/Adjust	×	×			
Lubricate front fork			×		

NOTE: Above time schedule applies to vehicles used on dry paved surfaces. If used in wet, muddy or sandy areas maintenance should be more frequent. Always check controls and lighting before any trip.

LOOK FOR THIS SYMBOL TO POINT OUT IMPORTANT SAFETY PRECAUTIONS. IT MEANS - ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED.

LUBRICATION AND MAINTENANCE

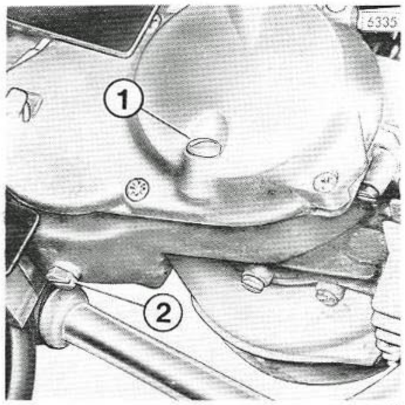


Figure 1

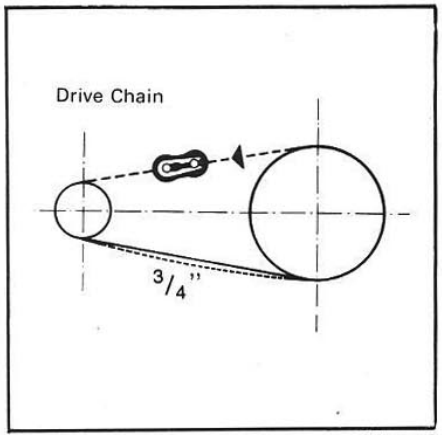


Figure 2

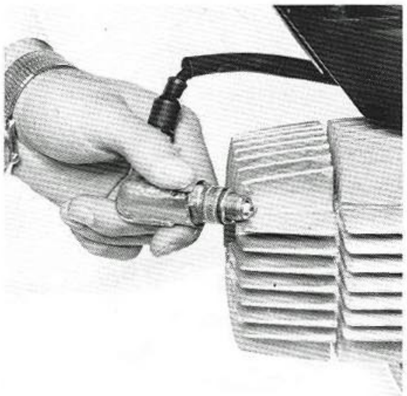


Figure 3

LUBRICATION

Changing Gearbox oil

1) Warm up the engine. / Stop engine.
2) Remove the oil fill plug (figure 1/1) and oil drain plug (figure 1/2).
3) Drain Oil.
4) Replace drain plug.
5) Fill with fresh automatic transmission fluid - TYPE F ONLY. (oil capacity 5.74 oz (170 cc) to bottom of oil fill hole.
6) Replace oil fill plug.

Cleaning and oiling the chains

ENGINE SHOULD NOT BE RUNNING.

Both engine drive and pedal chains should be kept clean. Every few hundred miles wipe chains thoroughly with a cloth, and using a small brush, lubricate with chain oil lubricant.

Always keep chains properly adjusted. The proper slack of the drive chain should be ¾". To adjust the chains, loosen the axle nuts and tighten or loosen the rear adjuster nuts. Once chains are properly adjusted, tighten the axle nuts. Make sure that wheels are always aligned.

Kickstand lubrication

Remove the stand spring. Remove three hexagon bolts. Remove stand. Grease both halves of the stand pivot with a good automotive lithium base grease.

Adjusting Screws and Pivot Bolts

Lubricate adjusting screws, tensioning screws and pivot bolts on control levers with a few drops of oil.

MAINTENANCE

Please contact an authorized Service Center for work you do not wish to carry out yourself. The agent will be pleased to advise and help.

Checking spark plugs

Unscrew spark plug. Insert spark plug into suppressor on spark plug wire and touch spark plug electrode to a ground, such as the cylinder head. A strong spark must be visible between the spark plug electrodes when operating the starter. Oily plugs or dirty electrodes do not spark and must be cleaned first with a piece of wood or a steel wire brush. The electrode gap should be from .016 - .020 in (0.4 to 0.5 mm), if larger, adjust by bending the ground electrode. When replacing the spark plug be certain thread matches properly and the plug can be screwed in easily. Never apply force. Screw in plug by hand for 2 to 3 turns before using the spark plug spanner.

MAINTENANCE

Decarbonizing the engine

Carbon deposits on the cylinder head, piston crown and in the exhaust ports are normal with all two-stroke engines and can eventually lead to trouble if not removed in time. Combustion deposits from oil as well as from fuel must therefore be removed regularly.

Cylinder head and piston crown

Carbon deposits on the cylinder head and piston crown should be removed only with a soft, blunt edged instrument to avoid damage to the light alloy casting. Scratching should be avoided since every new scratch will collect more carbon in future use.

Only scaly deposits need be removed from the piston crown. There is no need to disturb the piston if it is covered only by a uniform layer of oil carbon. Before refitting the cylinder head, thoroughly remove all carbon deposits and scrapings from the cylinder wall with a nonfraying soft cloth and smear the surface lightly with motor oil. Turn over the engine a few times to make sure it cranks easily. Clean the mating surfaces with a clean rag. Replace the cylinder head and tighten the four cylinder head nuts.Be sure to tighten two cylinder head nuts diagonally across from each other before tightening the other two nuts. (7 ft/lb) (10 Nm.)

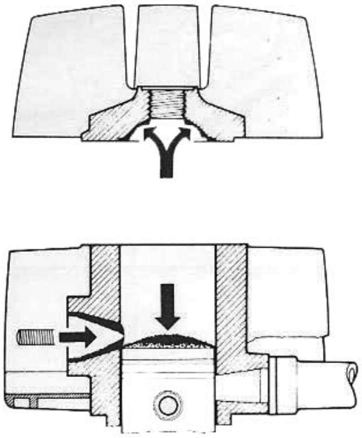


Figure 4

Exhaust port

In order to clean the exhaust port, remove the exhaust pipe. Crank the engine over (with the spark plug removed to reduce compression) until the piston reaches its lowest point. Remove the oil carbon from the exhaust port. Take care not to damage the piston or cylinder surfaces. When cleaning the exhaust port, it is also a good idea to clean the muffler.

Cleaning the muffler

Unscrew and pull off the exhaust endpiece. Remove oil-carbon deposits from the inside of the muffler using a scraper. Also carefully remove the oil deposits from the fastening device and from the pipes of the exhaust endpiece. Replace the gaskets if necessary.

NOTE: For further break-down of exhaust system refer to diagram.

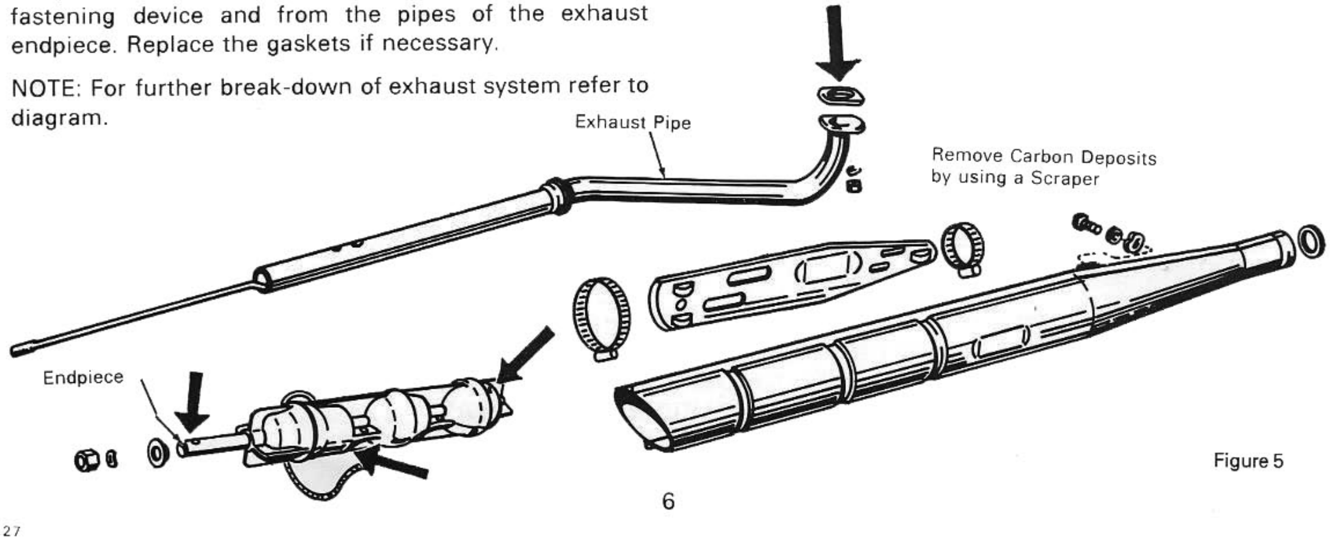


Figure 5

LUBRICATION AND MAINTENANCE

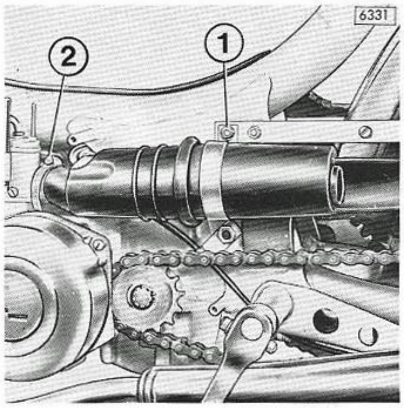


Figure 6

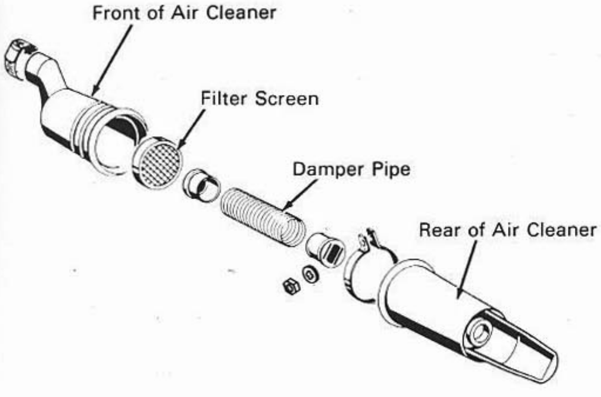


Figure 7

Cleaning the air cleaner

Remove the left hand chain guard. Remove clamp nut **1**. Loosen clamp screw **2** and remove air cleaner assembly from the carburetor. Remove front part of the air cleaner using a drift and carefully push out filter screen. Wash filter screen in solvent and allow it to dry thoroughly before replacing. Reassemble damper pipe, filter screen, and air cleaner assembly.

Cleaning the fuel valve and line

Empty fuel tank. Pull the fuel line from the fuel valve and blow air thru line until clear. Unscrew the fuel valve. Clean the valve and strainer by washing with solvent.

Cleaning the carburetor

Maintenance operations on the carburetor are outlined in Section III, FUEL SYSTEM AND CARBURETION.

Cleaning the main jet, needle jet and float chamber.

1) Close the fuel valve.
2) Remove the left hand chain guard.
3) Remove the air cleaner.
4) Loosen carburetor clamping screw (figure 8/1).
5) Pull the fuel pipe from the carburetor.
6) Turn the carburetor with its float chamber (bottom) towards the clutch side and pull off.
7) Loosen screws and pull out the top parts (figure 8/2) with throttle slide and choke.
8) Screw off the float chamber.
9) Unscrew the main jet from the needle jet and clean by blowing through or by using a stiff bristle. Never use a piece of wire. Also, unscrew needle jet and clean.
10) Clean the float chamber with gasoline.
11) Wash carburetor body and blow through. Make sure that the bores are not clogged with dirt.
12) When refitting the jets, tighten them properly.

CARBURETOR ADJUSTMENT

Minor carburetor adjustment may be required to compensate for differences in fuel, temperature, altitude and load.

IDLE ADJUSTMENT

Start engine and run at moderate speed intil operating temperature is reached. Adjust idle speed by turning idle adjustment screw (figure 8/3) in or out until engine runs smoothly.

THROTTLE CABLE ADJUSTMENT

Check for proper throttle cable slack (.040 in/1.0 mm). Insufficient cable slack will hold the throttle partially open and the idle adjusting screw will not function. If necessary, loosen the cable locknut (figure 8/4) and turn the throttle cable adjuster (figure 8/5) to the right to increase cable slack. Retighten the cable locknut.

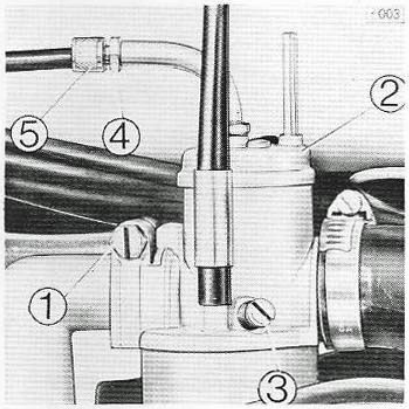


Figure 8

Exploded view of the carburetor

1	Inlet manifold
2	Carburetor body
3	Throttle slide stop screw
4	Needle jet
5	Main jet
6	Float needle
7	Float
8	Float chamber
9	Hose swivel connector
10	Throttle slide.
11	Jet-needle
12	Choke valve
13	Choke lever
14	Top cover
15	Slide spring

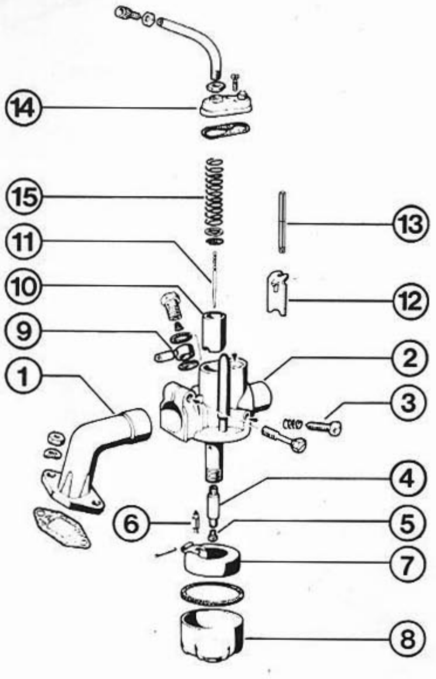


Figure 9

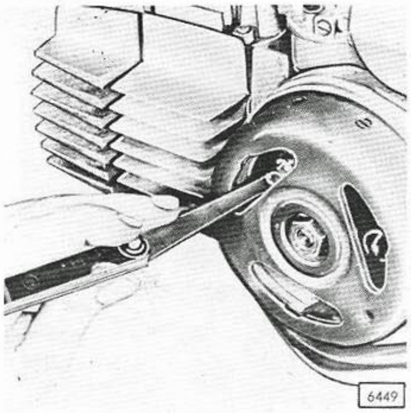


Figure 10

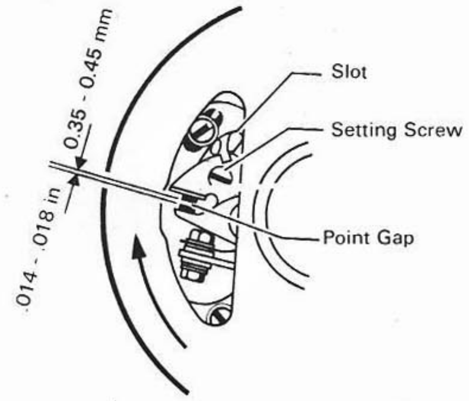


Figure 11

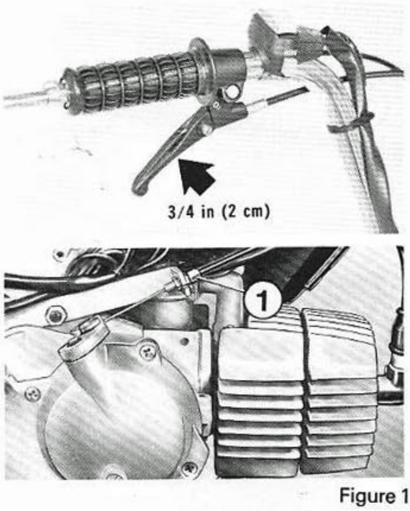


Figure 12

CHECKING THE IGNITION SYSTEM

Ignition timing

The engine will reach maximum output only if the ignition is correctly adjusted. See Section IV, Electrical System.

Contact breaking point gap

Check the point gap every 3600 miles. Remove the magneto cover located on the left side of the engine. Rotate the flywheel until the point gap is fully open and visable through one of the flywheel windows. Breaker points that are burnt should be replaced.

Measure breaker points gap with a feeler gauge (.014 - .018 in/0.35-0.45 mm). To adjust the breaker points gap, loosen the set screw slightly, insert a screwdriver blade into the slot on the breaker plate and turn the screwdriver slightly until a gap of .014-.018 in (0.35-0.45 mm) is obtained. Tighten the set screw and check that the gap has not altered.

Adjusting the starting lever

After the first 300 miles and then every 3600 miles check adjustment of the starting lever. The free play at the starting lever (measured at the end of the lever) should be ¾ in, (2 cm). Correct play is achieved by loosing the locknut (figure 12/1) and turning the adjuster until the correct lever travel is obtained. Tighten the locknut.

Checking the brakes

Front brake

The correct adjusted travel (measured at the end of the handbrake lever) is ¾ inch (2 cm) (figure 13) To adjust, loosen the locknut (figure 13/2) and turn the adjuster until brake lever travel is ¾ inch (2 cm). Tighten the locknut.

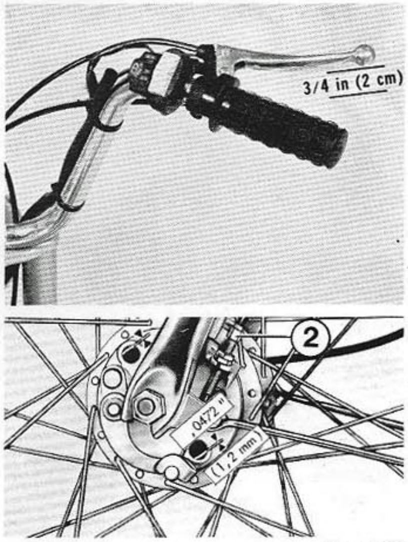


Figure 13

Rear Brake

The correct travel (measured at the end of the handbrake lever) is ¾ inch (2 cm). To adjust, loosen the locknut (figure 14/2) and turn the adjuster until brake lever travel is ¾ inch (2 cm). Tighten the locknut.

Brake linings

Pry plastic inspection plugs from wheel hub. Disconnect brake cable from brake lever. Insert a feeler gauge between brake drum and brake lining. Gap should not exceed .047" at either inspection hole, see figure 13. If gap exceeds this measurement, refer to Section VI on brake replacement. DO NOT OPERATE YOUR UNIT.

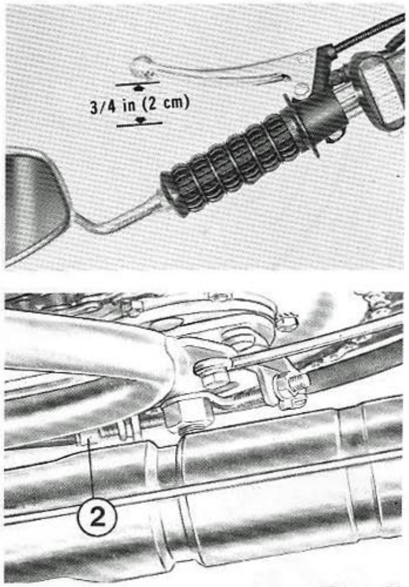


Figure 14

FRONT WHEEL REMOVAL

Unscrew speedometer cable from hub. Loosen locknut on brake cable and remove brake cable from hub. Remove the axle nuts. Remove wheel from fork.

To replace wheel reverse the above procedure. Be certain to readjust the brake before riding.

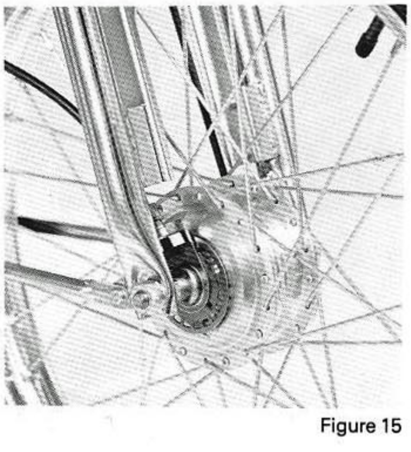


Figure 15

REAR WHEEL REMOVAL

Loosen the two chain adjusters (figure 16/1). Loosen both axle nuts (figure 16/2). Loosen the brake cable locknut (figure 16/4) and remove brake cable from brake arm (figure 16/3). Remove the chain adjusters. Push wheel forward. Remove the two chains from their sprockets. Tilt machine to the left and remove the wheel.

To replace wheel reverse the above procedure. Be certain to readjust the brake before riding.

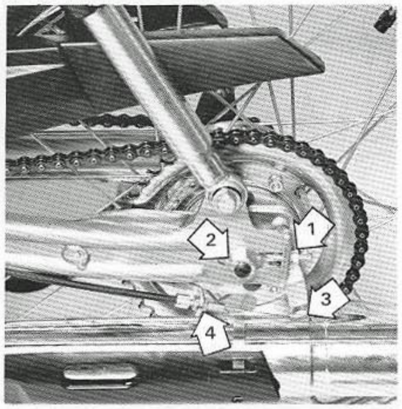


Figure 16

REPLACING HEADLIGHT

Remove the screw from the bottom of the chrome retainer. Remove wire clips holding headlamp in retainer. Remove headlight and replace with Sealed-beam light (see Technical Data Section for size of bulb).

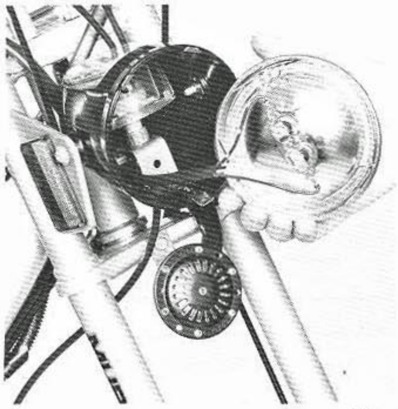


Figure 17

REPLACING REAR LIGHT BULB AND STOP LIGHT BULB

Remove the two screws that hold the lense. Remove bulb and replace (see the Technical Data section for size of bulb).

Stop light bulb (top) and rear light bulb (bottom).

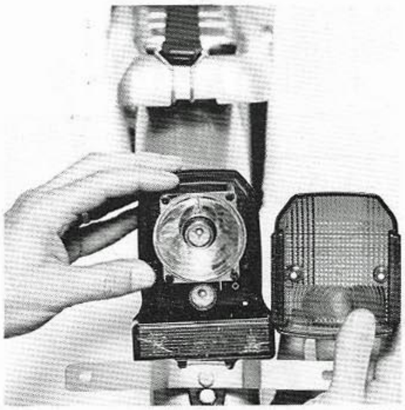


Figure 18

TIRE REMOVAL

1. Let air out of the tire by pushing in the valve core. Push valve stem thru hole in rim.
2. Separate the tire bead from the sides of the rim by pressing with the thumbs. Work your way around the tire on both sides to be sure that the bead of the tire is not sticking to the rim.
3. Use tire tools or spoons with rounded ends to lift the bead on one side of the tire off the rim. Be careful not to pinch the inner tube between the tire tools and the tire bead or the rim.
4. Pull the inner tube out from between the tire and rim.
5. Lift the bead of the tire up over the side of the rim and pull off tire.

TIRE INSTALLATION

1. Check the rim strip to be sure it is covering all spoke ends.
2. Wet tire bead with soapy water. Roll the tire bead, on one side of the tire, onto the rim. Put the tube into the tire and inflate it only enough to hold the tube during assembly.
3. Make certain that valve stem is protruding squarely through the rim. At this point it may be desirable to let some air out of the inner tube to make the next step easier.
4. Starting in the area of the valve stem, press the other tire bead onto the rim using both hands. Work your way to the opposite side of the wheel. Be careful to not pinch the tube between the tire bead and the rim. If the last few inches of the bead cannot be pressed onto the rim by hand, a rubber hammer may be used to get the tire over the rim. Be careful to not pinch the inner tube.

⚠ **USE ONLY A HAND PUMP OR FOOT PUMP TO INFLATE TIRES. BECAUSE OF THE SMALL VOLUME CAPACITY OF TIRES, SERVICE STATION AIR HOSES INFLATE TIRES VERY RAPIDLY. THEY ARE ALSO USUALLY CAPABLE OF PRESSURE BEYOND THAT WHICH THE TIRE CAN HOLD.**

5. Inflate the tire to about half the recommended pressure and check to see that the tire bead is seated properly on the rim. If it is not, use thumb pressure to seat bead.
6. Inflate the tire to full pressure.

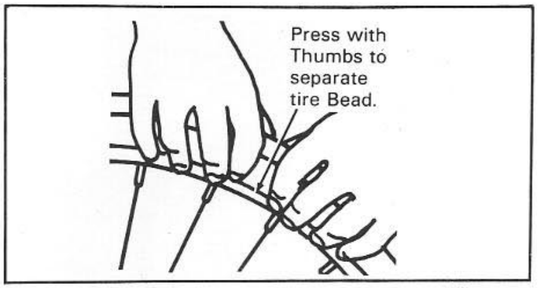

Press with Thumbs to separate tire Bead.

Figure 19

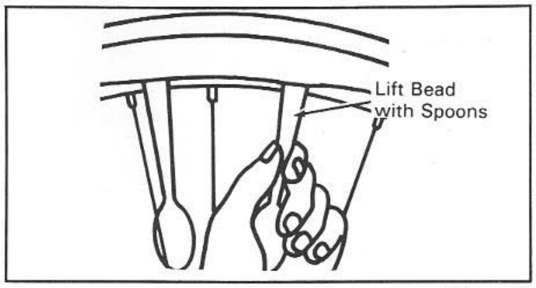


Figure 20

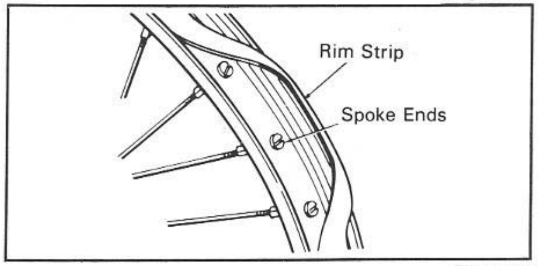


Figure 21

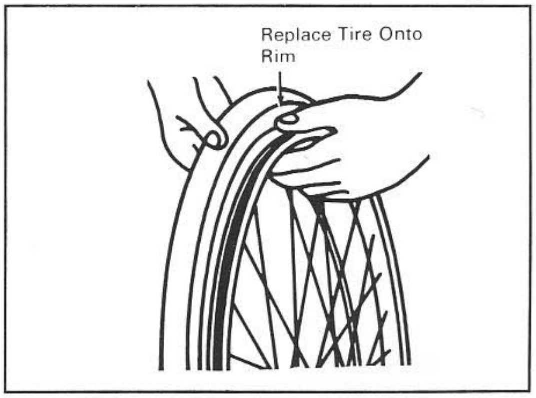


Figure 22

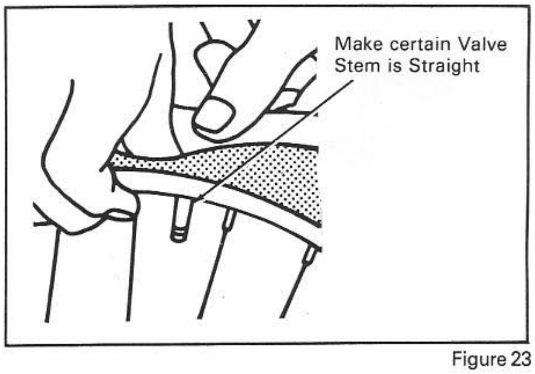

Make certain Valve Stem is Straight

Figure 23

SECTION II

ENGINE, CLUTCH, REDUCTION GEAR

SPECIAL TOOLS

LARGE KIT 313700

SPECIAL TOOLS
(Revised)

KIT NUMBER 313700
(Includes the following)

Part No.	Description
313702	Flywheel Extraction Tool
313703	Flywheel Locking Device
313706	Main Bearing Puller
313713	Bearing Installation Sleeve
313716	Special Plate
313719	Ignition Timing Device
313727	Sprocket Spanner
313731	Clutch Puller

Please contact Murray Ohio Leisure Product Service Division, P.O. Box 268, Brentwood, Tenn. 37027, on any other special tools that you may require.

TECHNICAL DATA

ENGINE

Maximum output	1.5 hp	at 4,500 r.p.m.
Maximum torque		1.79 ft/lb (0.248 mkp) at 3,000 r.p.m.
Compression ratio		9.2 : 1 (7.1 : 1)
Maximum output	2.0 hp	at 5,000 r.p.m.
Maximum torque		2.06 ft/lb (0.285 mkp) at 4,500 r.p.m.
Compression ratio		9.2: 1 (7.1 : 1)
Bore		1.49 in. (38 mm)
Stroke		1.69 in. (43 mm)
Displacement		48.8cc
Cooling		air cooled
Lubrication		gas / oil
Carburetor	1.5 hp	Bing 1/14/164
Main jet		52/50
Needle jet		2.12 A
Needle position		1st notch from top
Carburetor	2.0 hp	Bing 1/14/163
Main jet		68/66
Needle jet		2.12A
Needle position		1st notch from top
Ignition		magneto ignition
Breaker point gap		0.014-0.018 in. (0.35-0.45 mm)
Ignition timing		0.051-0.067 in (1.3-1.7 mm) B.T.D.C.
Spark gap		0.016-0.020 in. (0.4-0.5 mm)
Spark plug	1.5 hp	Bosch W 175 T1 (Bosch W 7A) Champion L 86
Spark plug	2.0 hp	Bosch W 200 T35 (Bosch W 6B) Champion L 82
Dynamo		Flywheel magneto Bosch RCP1 6 V 26-5/10W
Ignition coil		outside the generator

POWER TRANSMISSION

Gearbox		single speed automatic
Clutch		centrifugal
Primary transmission		helical gears
Secondary transmission		chain ½"x3/16"
Pedalling chain		chain ½"x⅛"
GEAR RATIOS		
Engine gear	1.5 hp	106 : 21; i= 5.05
Gear-rear wheel		45 : 13; i= 3.46
Pedalling transmission		28 : 23; i= 1.217
Engine gear	2.0 hp	106 : 21; i =5.05
Gear-rear wheel		45 : 15; i= 3.00
Pedalling transmission		28 : 23; i = 1.217

CHASSIS

Frame	tubular frame
Front wheel suspension	telescopic fork; 2.95 in. (75mm)spring travel
Rear wheel suspension	shock absorbers 1.96 in. (50 mm) spring travel (internal springs)
Brakes	Internal expanding shoe brakes
Dia. of brake drum	3.15 in. (80 mm)
Width of brake lining	0.70 in. (18 mm)
Tire size front and rear	21/2.25
Tire pressure front/rear	26/32 psi (1.8/2.25 kg/cm²)
Fuel tank Capacity Including Reserve	0.91 US gal. (3.4 litres)
Reserve Capacity	0.16 US gal. (0.6 litres)

TECHNICAL DATA

WEIGHTS AND DIMENSIONS

Wheelbase	45.5 in. (114.3 cm)
Overall length	69.4 in. (176.3 cm)
Overall width	27.3 in. (69.3 cm)
Overall height (no mirror)	43.3 in. (109.9 cm)
Ground clearance	6.7 in. (17.0 cm)
Dry weight	103 lb. (46.4 kg)

ELECTRICAL EQUIPMENT

Headlamp bulb	6 V, 25 Watt, Sealed-beam
Taillamp/Stoplamp bulb	6 V, 5/10 W

PERFORMANCE AND CONSUMPTION

Top speed	1.5 hp, 25 mph (40 km/h)
	2.0 hp, 30 mph (45 km/h)
Hill climbing ability	12-15 %
Standard fuel consumption	1.5 hp, 153 m.p.g. (1.54 liters/100 km)
	2.0 hp, 148 m.p.g. (1.78 liters/100 km)

FUEL CONSUMPTION

Test commenses on a flat track in top gear at 3/4 top speed. The track length of 6.2m (10 km) is used both ways and may have very short upward and downward gradients of a maximum of 1.5%. The vehicle must be adjusted to specification and tires must have correct pressure. The rider must not weigh more than 143lb (65kg). To compensate unfavourable conditons the measured consumption is increased by 10%. Production may differ up to 5% from this volume.

CAPACITY AND QUALITY OF LUBRICATION

ENGINE	Mixture of regular gasoline. Mixture ratio 50 : 1 with special two stroke oil.
GEARBOX	5.74 oz (170 cc) Automatic-Transmission-Fluid
WHEEL BEARING	Summer and winter Lithium base grease.
CHAIN	Summer and winter SAE 90.

ENGINE LUBRICATION

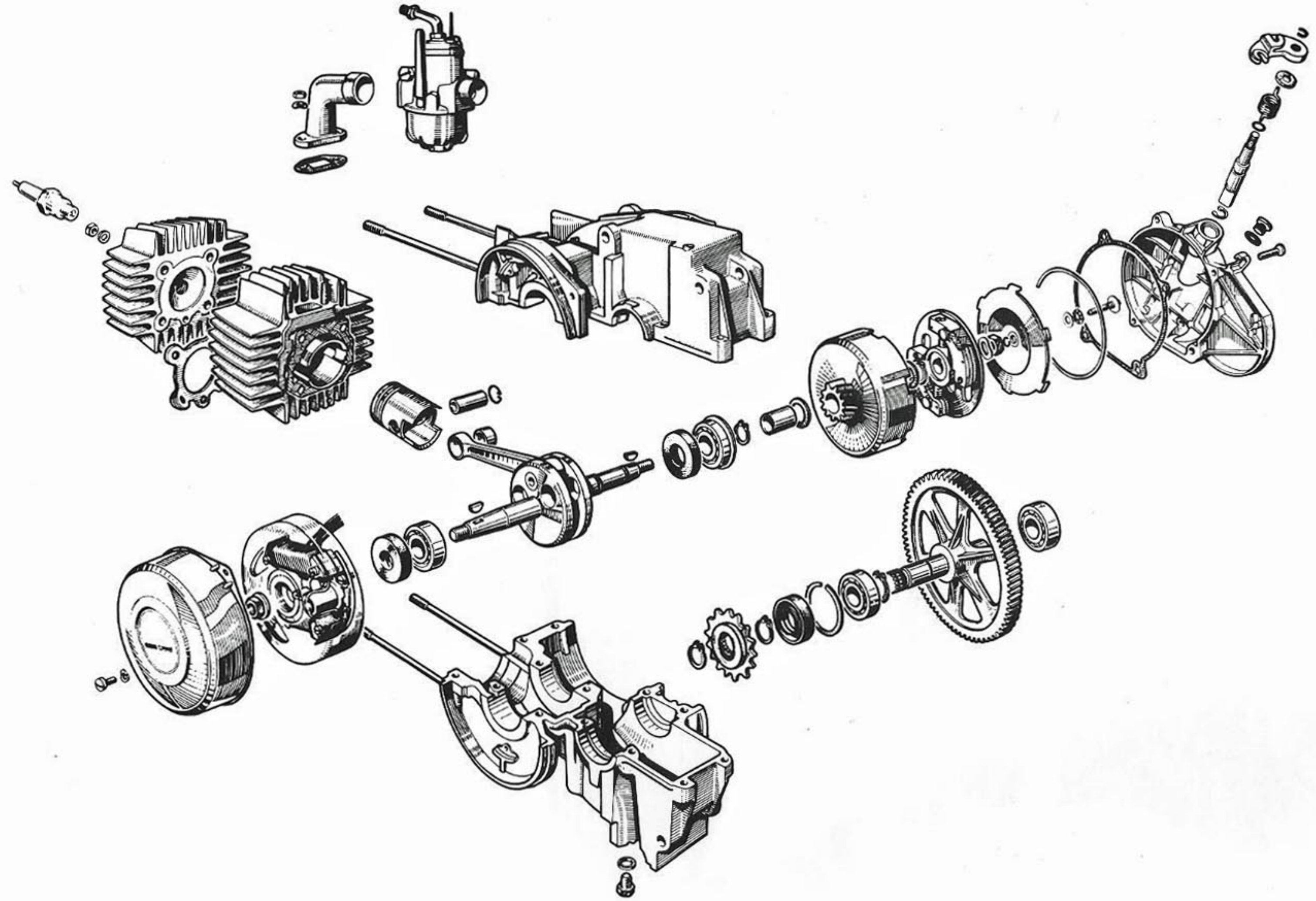
Gas/Oil mixing

Like most two stroke engines, oil must be added to the gasoline in pre-measured amounts, then both oil and gasoline should be thoroughly mixed together before fueling the tank. The correct gasoline is regular grade. Do not use unleaded gasoline. The correct oil is special two stroke oil which is physically formulated for a 50 : 1 mixture.

NOTE: When using pre-mixed fuel, always shake the container thoroughly as oil has tendency to settle out.

Gasoline is flammable and explosive under certain conditions. Always perform procedures in a well ventilated area. Do not smoke or allow open flames in the vicinity. Never add fuel while engine is running. Avoid spilling gasoline over hot surfaces as warm engine or muffler.

1 SPEED AUTOMATIC-ENGINE-48.8-CC



ENGINE REMOVAL

Place the unit onto a bench with the rear wheel supported in a stand.

Note: Kickstand is clamped into the crankcase, and is removed with the engine. Frame must be supported before engine is removed.

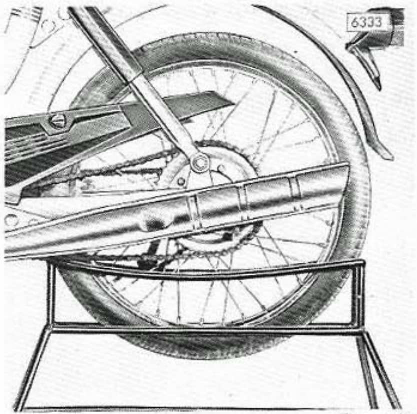


Figure 24

Remove left and right hand chain guards. Remove gear box, drain plugs and drain transmission fluid.

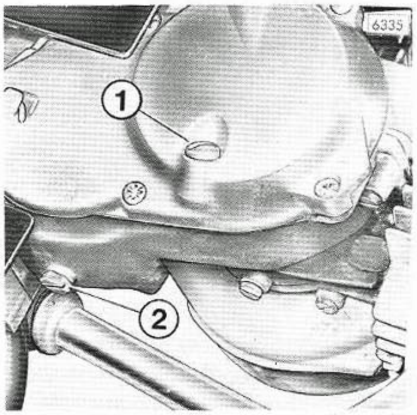


Figure 25

Disconnect the plastic electrical connectors (1).

Remove suppressor (2) from spark plug.

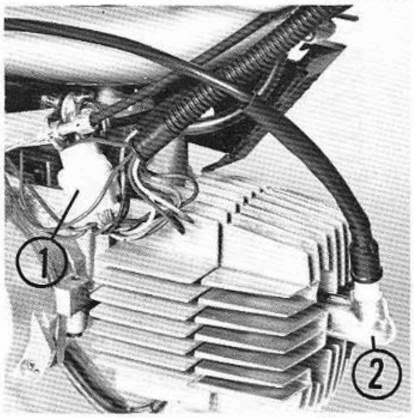


Figure 26

REMOVE ENGINE

Loosen starter cable adjustment, twist starter lever and disconnect cable from lever.

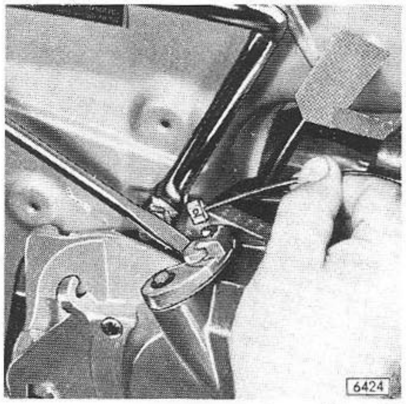


Figure 27

Disconnect drive chain by removing the master chain link.

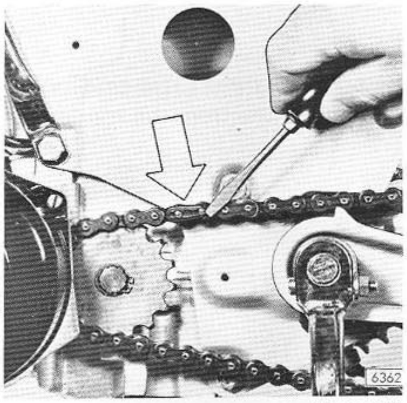


Figure 28

Disconnect muffler by removing both exhaust nuts on cylinder head and the mounting bolt on the muffler.

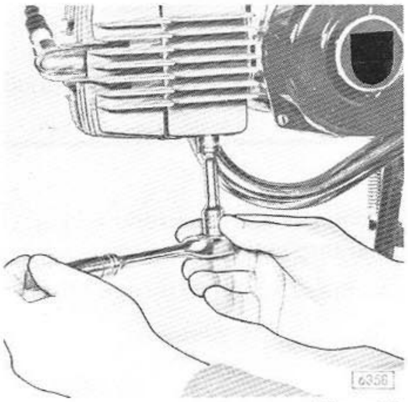


Figure 29

Remove clamp nut (figure 30/1) and loosen clamp screw (Figure 30/2). Pull air cleaner assembly from the carburator.

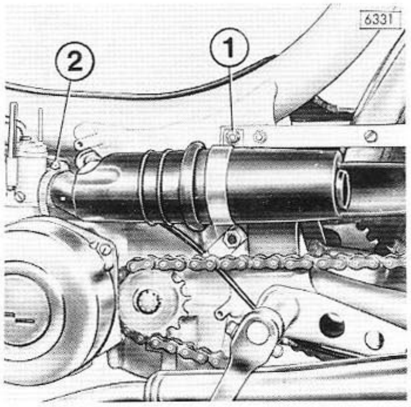


Figure 30

REMOVE ENGINE

Turn fuel valve to "OFF" position. Disconnect fuel hose. Loosen carburetor clamp screw and twist carburetor to the left. Remove carburetor from intake manifold.

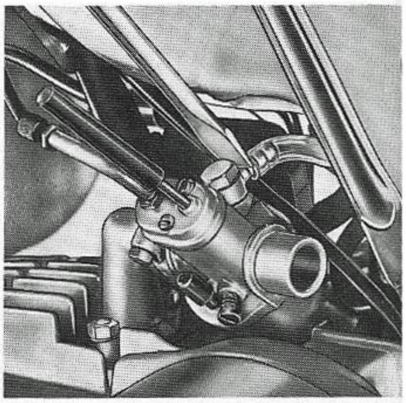


Figure 31

Remove the three (3) engine mounting bolts (note arrows) and lift engine from the frame.

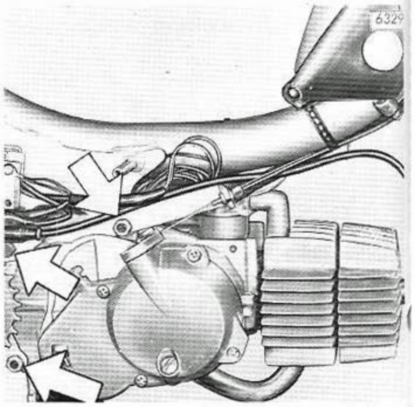


Figure 32

DISMANTLE ENGINE

Disconnect the kickstand spring. Unscrew the kickstand mounting bolts and remove kickstand.

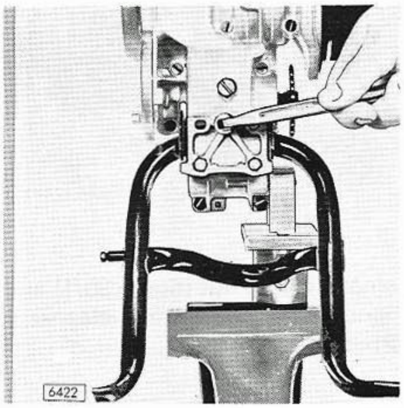


Figure 33

DISMANTLE ENGINE

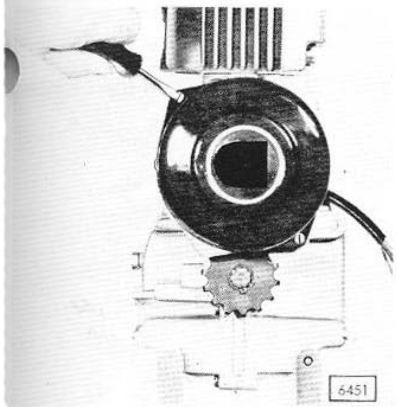


Figure 34

Attach engine to engine holder (P/N 313701). Remove magneto cover.

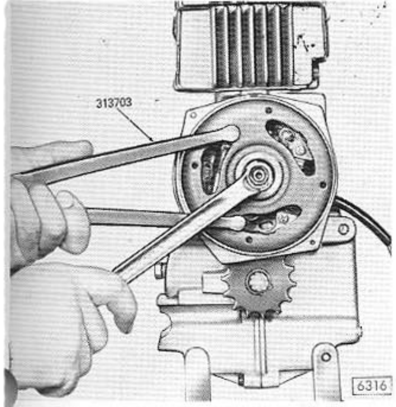


Figure 35

Hold flywheel with locking tool (P/N 313703) and unscrew flywheel nut.

Remove flywheel from crankshaft with special puller (P/N 313702).

Note: Do not lose woodruff key. Remove magneto stator plate.

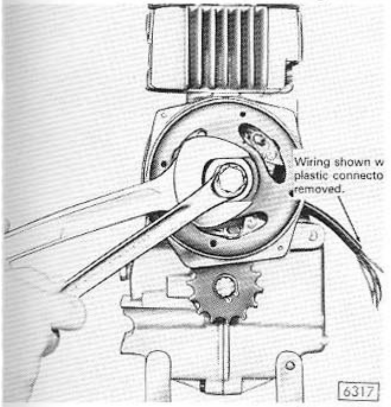


Figure 36

Remove wiring pins from plastic connector using small screwdriver to depress locking tabs on wiring pins. Jumper wire need not be removed.

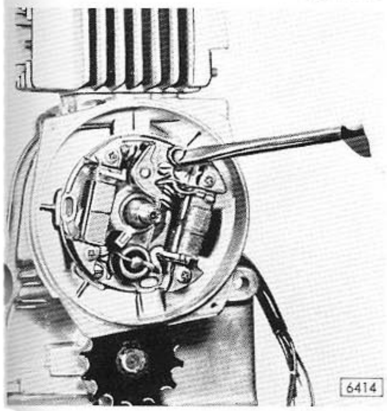


Figure 37

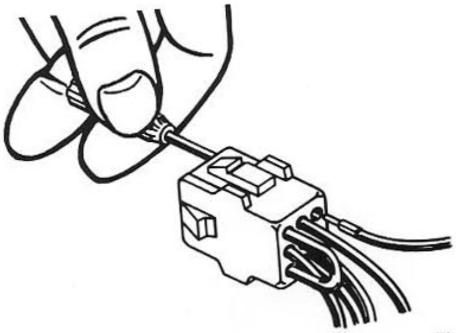


Figure 38

After unscrewing the base plate screws, remove the base plate assembly and pull out the generator wiring including the rubber grommet.

DISMANTLE ENGINE

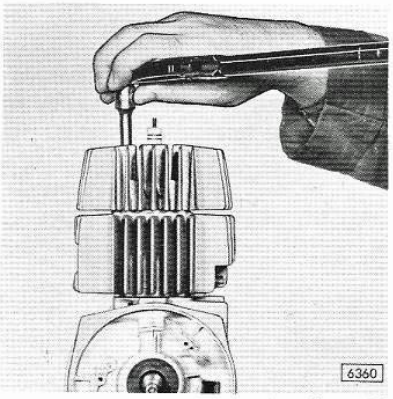


Figure 39

After removing the cylinder head nuts lift off the cylinder head.

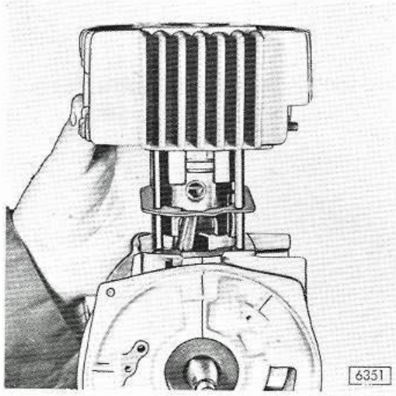


Figure 40

Remove cylinder and base gasket.

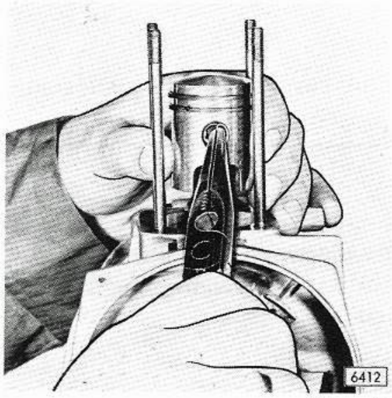


Figure 41

Remove wrist pin retaining rings.

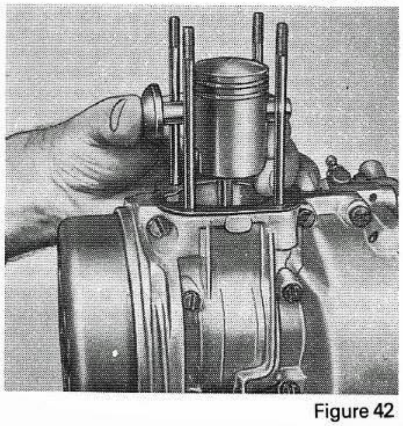


Figure 42

Push out the wrist pin and remove piston.

DISMANTLE ENGINE

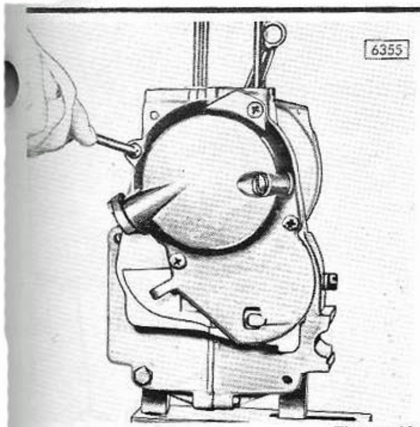


Figure 43

Remove all clutch cover screws and the clutch cover.

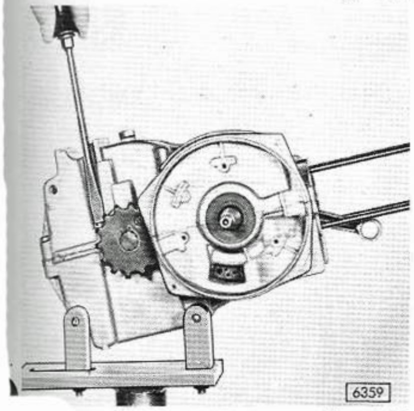


Figure 44

Mount engine in engine stand so that the lower crankcase half is facing upward. Remove all crankcase screws.

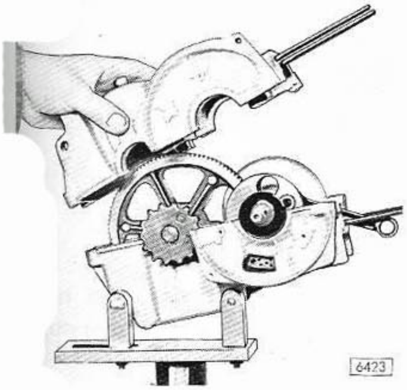


Figure 45

Slightly tap the upper crankcase half with a rubber hammer to break sealant between the two housing halves and remove top half.

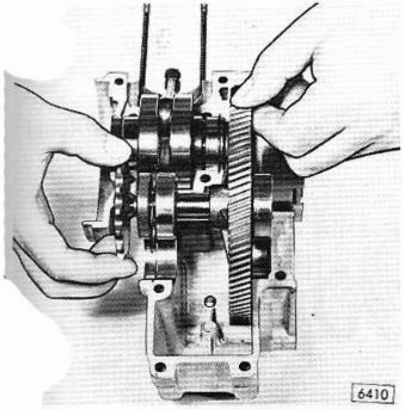


Figure 46

Lift primary drive assembly from lower crankcase half.

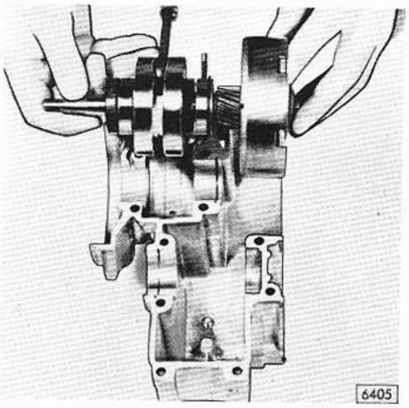


Figure 47

Remove crankshaft with clutch assembly.

DISMANTLE CRANKSHAFT

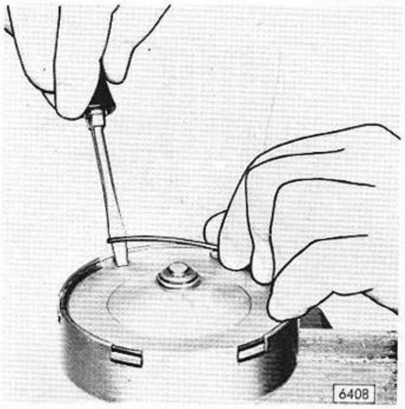


Figure 48

Remove large retaining ring in clutch drum and lift off friction plate.

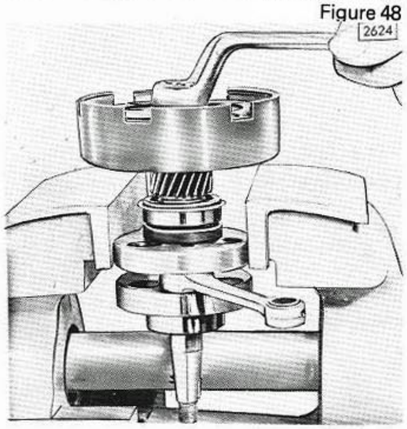


Figure 49

CAUTION:
To prevent damage to crankshaft, clamp crankshaft with the web closest to clutch. Do not clamp crankshaft with both webs in vice as this will bend crankshaft.

Hold crankshaft, clutch side up, in a vice that has aluminum or plastic jaws. Remove the clutch retainer nut.

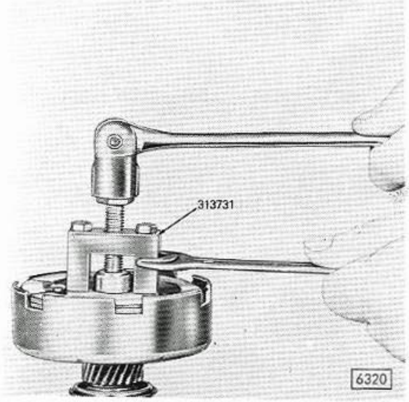


Figure 50

Use special puller (P/N 313731) to remove centrifugal clutch from crankshaft.

NOTE:
Clutch assembly may also be dismantled with engine mounted in frame.

DISMANTLE ENGINE

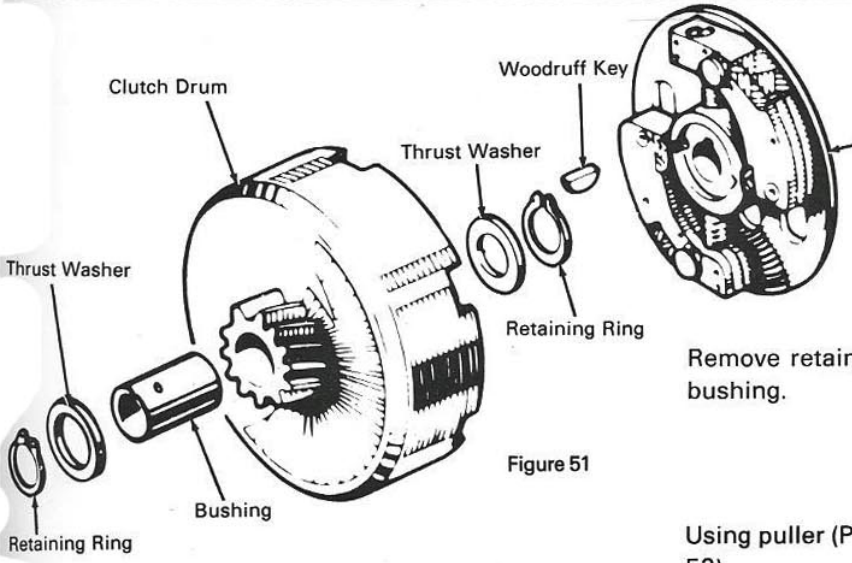


Figure 51

Remove retaining ring, thrust washers, clutch drum and bushing.

Using puller (P/N 313706), remove main bearings (Figure 52).

CAUTION: Clamp crankshaft web only on side of bearing that is being removed, or crankshaft damage will occur.

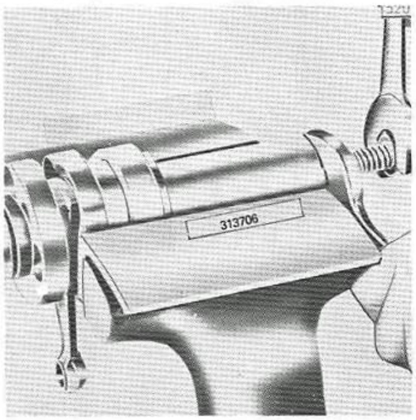


Figure 52

Note: Gearbox main shaft and primary drive gear are pressed together and must not be disassembled (Figure 53).

Remove retaining ring and chain sprocket.

Remove second retaining ring, oil seal, snap-ring, bearing and third retaining ring.

Note: Remove all traces of sealing compound and gasket. Throughly clean all parts in desgreasing solvent and visually inspect all parts for wear and damage. Check bearing seating and seal running areas.

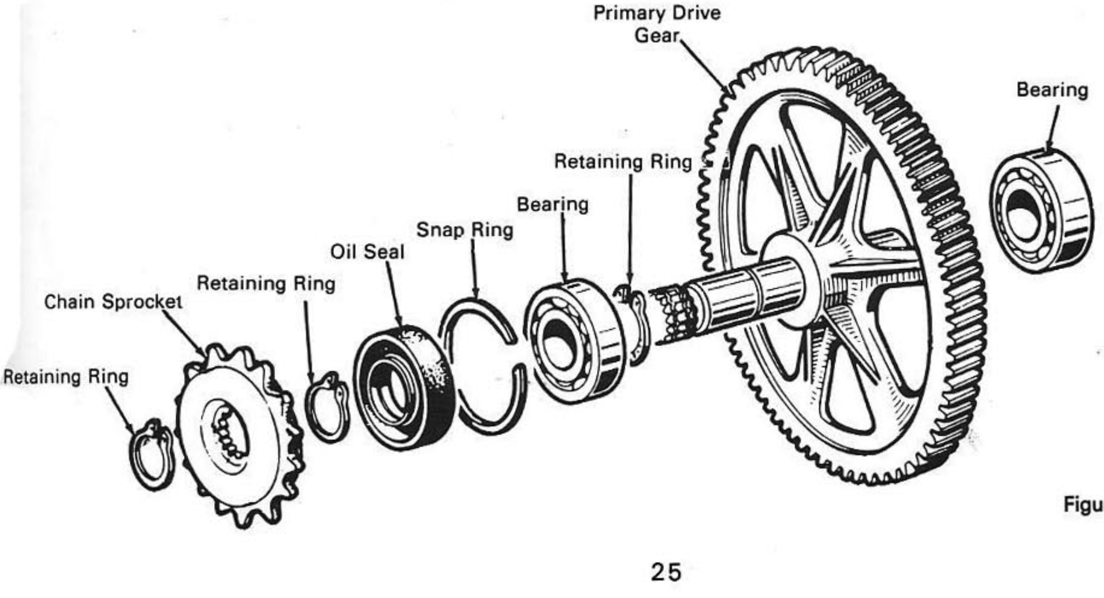


Figure 53

BIG-END BEARING CLEARANCE

CAUTION: If overheating, jamming or wear is apparent, crankshaft assembly must be replaced.

It is very difficult to measure the correct clearance and can only be carried out by the manufacturer. However, a very simple method is by firmly grasping the connecting rod to check for big end bearing wear. If rod is free but no play is noticeable, big end bearing is in good condition.

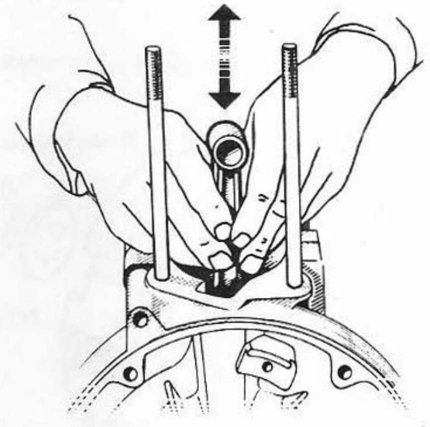


Figure 54

CONNECTING ROD ALIGNMENT

Measuring and straightening can be effected if the crankshaft is dismantled or, if still fitted to the engine, after removing the cylinder and piston. Measure as illustrated with a pair of steel blocks accurately ground to equal height, the wrist pin with a feeler gauge.

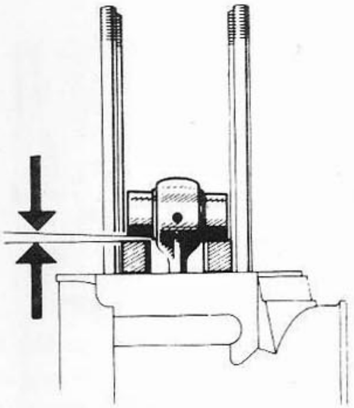


Figure 55

Straightening of the connecting rod can be carried out by means of two (2) home made forks as illustrated.

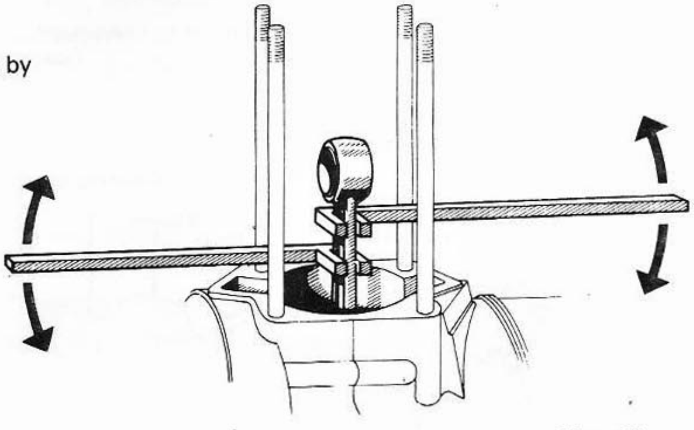


Figure 56

CRANKSHAFT

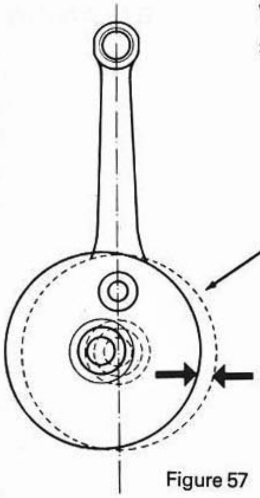


Figure 57

When completely dismantling the engine, the crankshaft should be checked as well.

1. Crank webs may be out of true.
2. Check bearing seating and seal running areas.

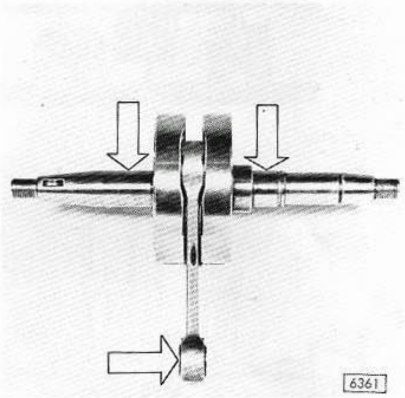


Figure 58

3. Crank journal is bent so that the webs are no longer parallel but oblique (outward).

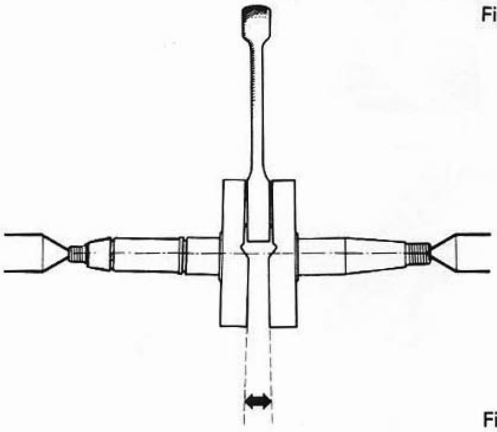


Figure 59

4. Crank journal is bent so that the webs are no longer parallel but oblique (inward).

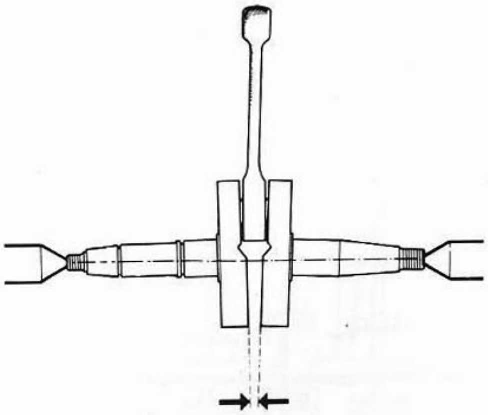


Figure 60

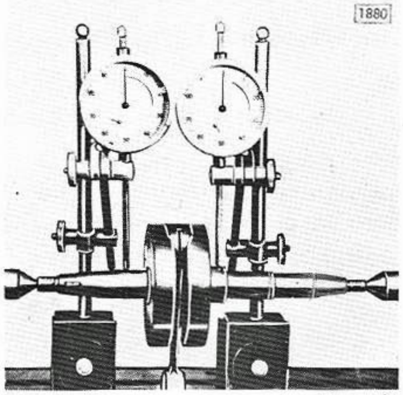


Figure 61

CRANKSHAFT-TESTING, BALANCING AND CENTERING

1. Crank webs are out of true:

With the big-end pointing upwards, clamp crankshaft between two center points. Place two dial indicators on the crankshaft journals close to the crank webs and set the dial indicators to zero.

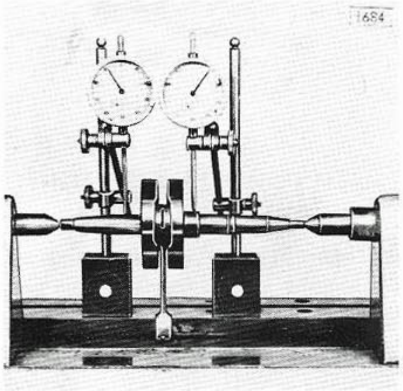


Figure 62

Rotate crankshaft downwards, one dial indicator will register plus, the other minus. Mark the position of the maximum reading on the crank web.

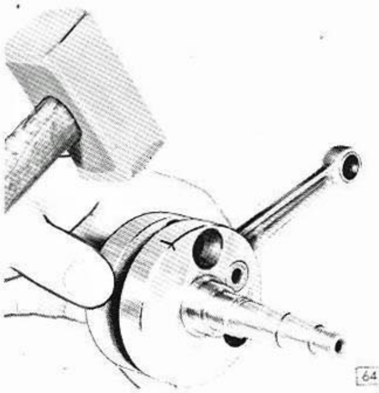


Figure 63

Remove crankshaft from dial indicator. Straighten crankshaft by hitting the maximum reading mark with a copper or plastic hammer.

Repeat testing with the dial indicator until the crankshaft is within the permissible tolerance, which is .0008 - .0010 in. (0,020 - 0,025 mm)

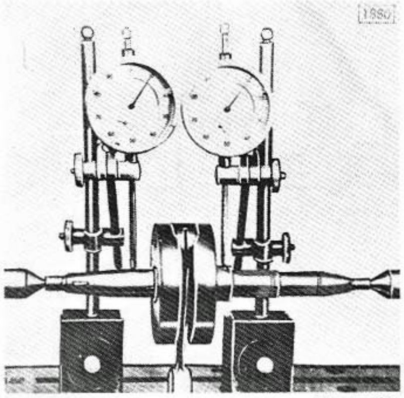


Figure 64

2. Crank webs are not parallel:

Set dial indicators to zero when the big end journal is parallel to the crank journals. Rotate crankshaft with big end journal upwards.

Readings taken are either both plus or both minus.

CRANKSHAFT

If the readings taken show that the crank webs are bent inwards (plus reading) the crankshaft is straightened by inserting a tapered bar in the narrow (Marked) position.

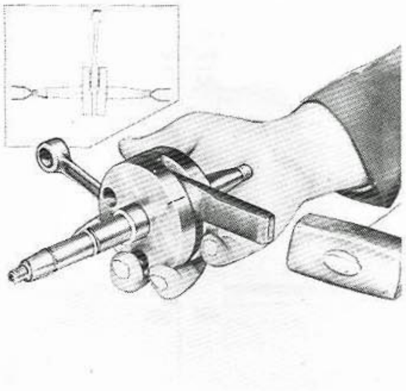


Figure 65

If the crank webs are bent outwards (minus reading) the crankshaft is straightened by hitting the flat side of the crank web. Repeat the procedure until the out of balance is within the permissible limit, which is .0008 - .0010 in. (0.020 - 0.025 mm)

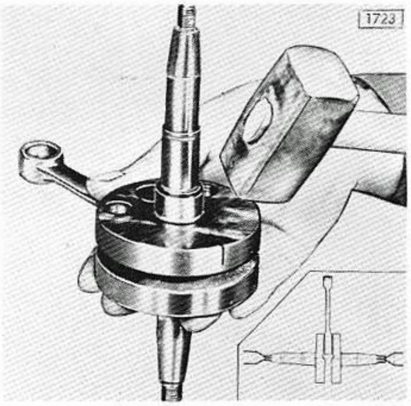


Figure 66

WRIST PIN-PISTON-CYLINDER

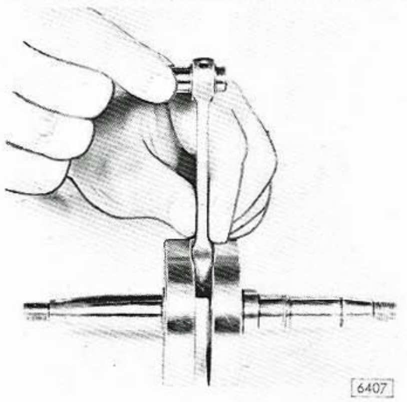


Figure 67

Before assembling an engine, always check the small end bushing for wear. If excessive wear is noticeable replace small end bushing.

SMALL END BUSHING

For correct wrist pin assortment and sizes see assorting table on page 31.

Fitting limits	Wear limit
.473 - .474 in.	.475 in.
12.008 - 12.020 mm	12.025 mm

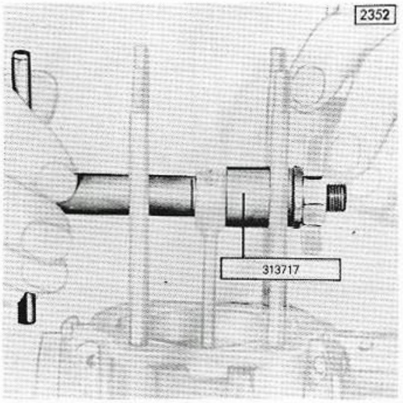


Figure 68

REPLACING SMALL END BUSHING

Use special tool (P/N 313717) to remove and replace bushing.

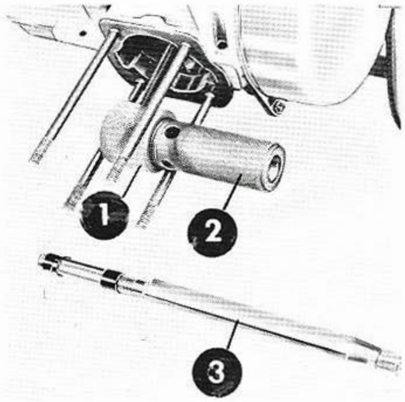


Figure 69

For centralizing and reaming use special tool (P/N 313718). To enable accurate reaming, place centralizing nut (figure 69/1) over little end, insert guide sleeve (figure 69/2) in centralizing nut.

Insert the reamer shaft (figure 70/3) in guide sleeve and centralize tool over little end bush. Tighten guide sleeve to centralizing nut.

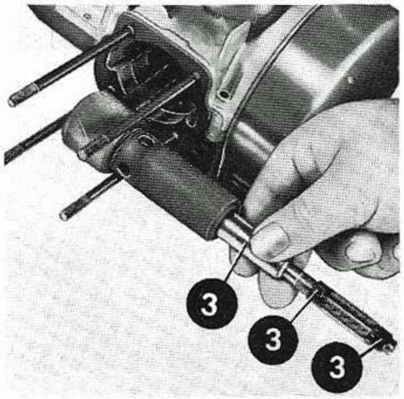


Figure 70

Adjust cutting edges of reamer to bush size, remove from guide sleeve and tighten adjustment nuts on reamer. Applying oil to reamer, start reaming procedure till correct wrist pin-bush clearance is achieved.

WRIST PIN-PISTON-CYLINDER

Wrist pin and piston fit are matched together and coded as follows:

yellow or blue dot inside piston
2 or 3 dots on end of wrist pin

SORTING TABLE

Wrist pin boss		Wrist pin		Clearance
Group	Diameter	Group	Diameter	
yellow	.4728 - .4727 in.	2	.4726 - .4724 in.	.0001-.0003 in.
	12.008 - 12.006 mm		12.003 - 12000 mm	0.0030-0.0085 mm
blue	.4727 - .4726 in. 12.006 - 12.003 mm	2	.4726 - .4724 in.	.0001-.0002 in.
			12.003 - 12.000 mm	0.0050-0.0060 mm
		3	.4725 - .4723 in.	.0001-.0003 in.
			12.000 - 11.997 mm	0.0035-0.0090 mm

Piston-cylinder

Piston and cylinder fit are matched in 5 combinations which are marked on the piston crown, on the joint surface of the cylinder top as follows:

1,2,3,4 or 5 on piston crown
1,2,3,4 or 5 on cylinder head mating surface

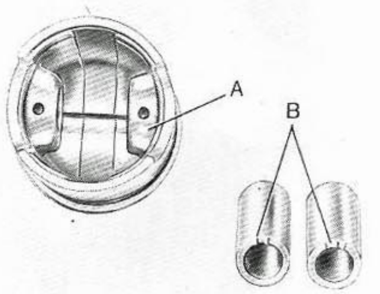


Figure 71

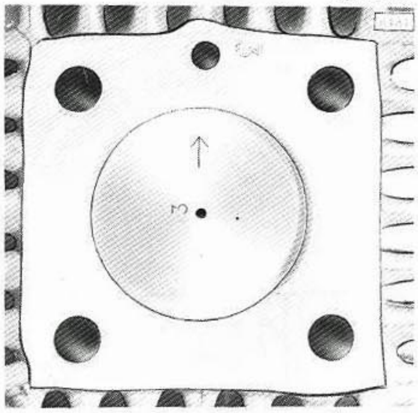


Figure 72

NOTE: Piston/cylinder clearance limits are:

Min. 0.0008 in. (0.020 mm)
Max. 0.0016 in. (0.040 mm)

CAUTION:
Chromed cylinder cannot be bored.

CYLINDER

ALU-CYLINDER SORTING TABLE

Group	Cylinder diameter	Piston diameter
1	1.4950 - 1.4954 in. (37.975 - 37.985 mm)	1.4938 - 1.4942 in. (37.945 - 37.955 mm)
2	1.4954 - 1.4958 in. (37.985 - 37.995 mm)	1.4942 - 1.4946 in. (37.955 - 37.965 mm)
3	1.4958 - 1.4962 in. (37.995 - 38.005 mm)	1.4946 - 1.4950 in. (37.965 - 37.975 mm)
4	1.4962 - 1.4966 in. (38.005 - 38.015 mm)	1.4950 - 1.4954 in. (37.975 - 37.985 mm)
5	1.4966 - 1.4970 in. (38.015 - 38.025 mm)	1.4954 - 1.4958 in. (37.985 - 37.995 mm)

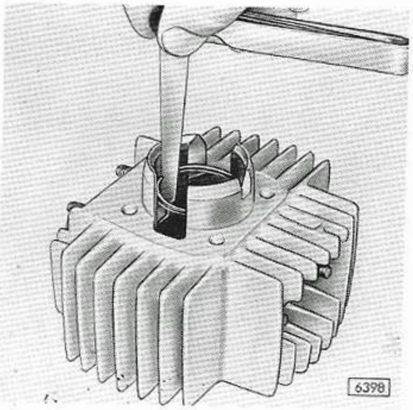


Figure 74

Piston ring gap is
New .006-.012 in. (0.15-0.30 mm)
Wear limit .020 in. (0.5 mm)

Using a cylinder bore gauge (shown in figure 74) measure bore, side to side and front to back, in the 3 positions shown in figure 75.

Maximum permissible ovality is:
.00098 in. (0.025 mm)

For greatest accuracy cylinder temperature should be 68° F (20° C).

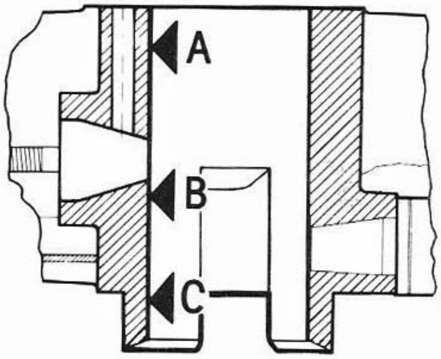


Figure 75

ASSEMBLING CRANKSHAFT

ASSEMBLING CRANKSHAFT

Use special tool (P/N 313716) between the two (2) crank webs and special installation sleeve (P/N 313713) to install flywheel side main bearing on crankshaft.

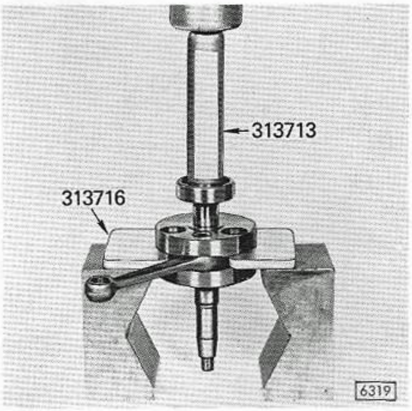


Figure 77

Lubricate oil seal and install crankshaft seal, sealing lips facing outward, on side of crank pin.

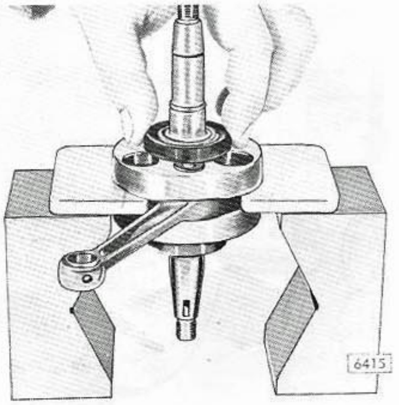


Figure 78

Again use installation sleeve (P/N 313713) to press clutch side main bearing on crankshaft, with the locating ring groove facing the outside.

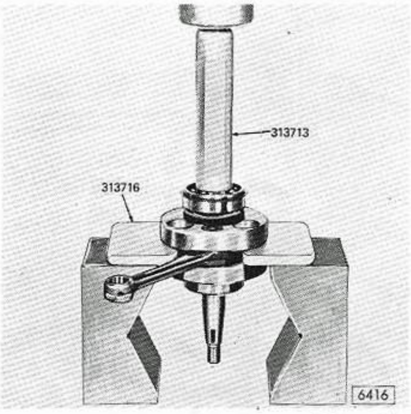


Figure 79

CLUTCH-ASSEMBLING

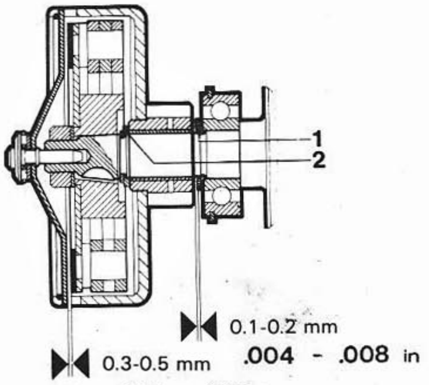


Figure 80

The clearance between the friction plate and the face lining of the centrifugal clutch should be between .012 - .020 in. (0.3-0.5 mm). The end-float of the clutch drum must be between .004 - .008 in. (0.1 - 0.2 mm). This clearance is achieved by various sizes of shims (figure 80/1 and 80/2). The correct adjustment procedure is outlined in the following steps.

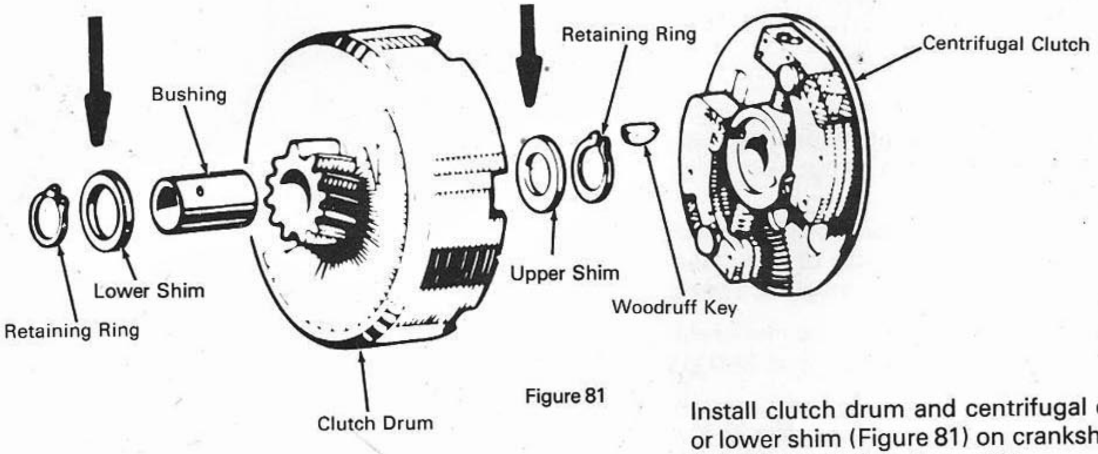


Figure 81

Install clutch drum and centrifugal clutch without upper or lower shim (Figure 81) on crankshaft. Torque nut to 20 ft/lb (27 Nm). (see figure 82)

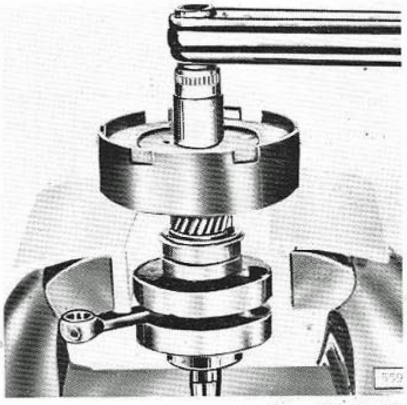


Figure 82

CAUTION:
To prevent damage to crankshaft, clamp crankshaft with the web closest to clutch. Do not clamp crankshaft with both webs in vice as this will bend crankshaft.

CLUTCH-ASSEMBLING

First establish the thickness of the lower shim. Press clutch drum down and measure maximum gap between primary gear and retaining ring on crankshaft with a feeler gauge. (figure 83)

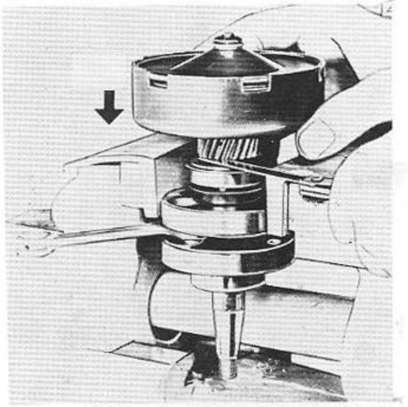


Figure 83

To this measurement add the required clearance of .012 - .020 in. (0.3 - 0.5 mm) between clutch cover and face lining. This would give the required thickness of the lower shim. (see figure 84)

EXAMPLE:		
	Primary gear/retaining ring gap	.047 in. (1.2 mm)
	Plus required gap	.012 in. (0.3 mm)
	Lower shim required	.059 in. (1.5 mm)

NOTE: Lower shim (24/17 mm) is available as follows:

.043 in	.051 in.	.059 in.	.067 in.
1.1 mm	1.3 mm	1.5 mm	1.7 mm

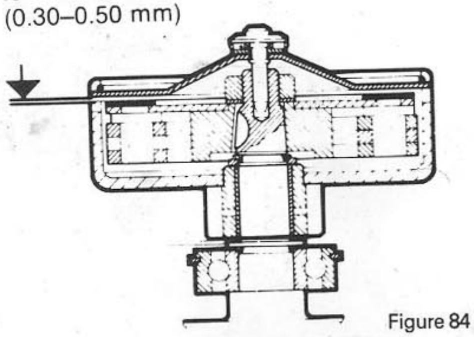


Figure 84

Lift clutch drum and measure the gap between primary gear and retaining ring on crankshaft (not retaining ring on bearing). Clutch drum must be skimmed to allow .004 - .008 in. (0.1 - 0.2 mm) end-float (figure 85).

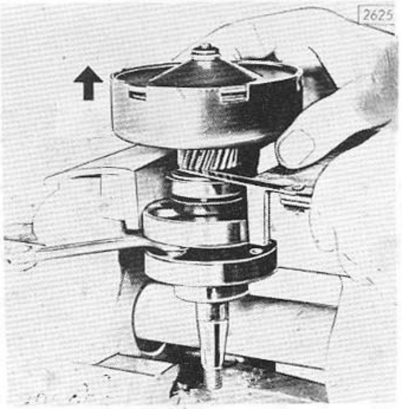


Figure 85

From this measurement deduct lower shim chosen and end-float. This will give required thickness of upper shim.

EXAMPLE:		
	Primary gear/retaining ring gap	.142 in. (3.6 mm)
	Less lower shim chosen	.059 in. (1.5 mm)
	Less required end-float	.008 in. (0.2 mm)
	Upper shim required	.075 in. (1.9 mm)

NOTE: Upper shim (22/15 mm) is available as follows:

.043 in.	.051 in	.059 in.	.067 in.	.070 in.	.073 in.
.075 in.	.077 in.	.079 in.	.083 in.	.087 in.	
1.1 mm	1.3 mm	1.5 mm	1.7 mm	1.8 mm	1.85 mm
1.9 mm	1.95 mm	2.0 mm	2.1 mm	2.2 mm	

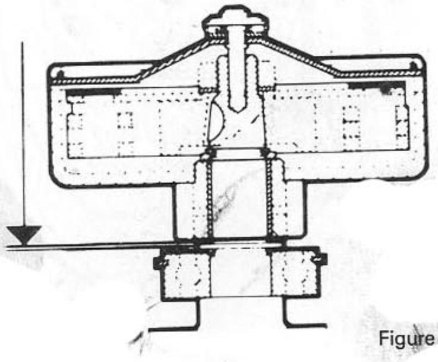


Figure 86

CLUTCH-ASSEMBLING

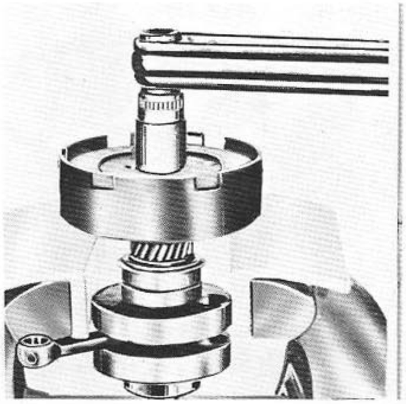


Figure 87

Once the required shims are established, remove clutch assembly and reassemble with shims.

Torque nut to 20 ft/lb (27 Nm).

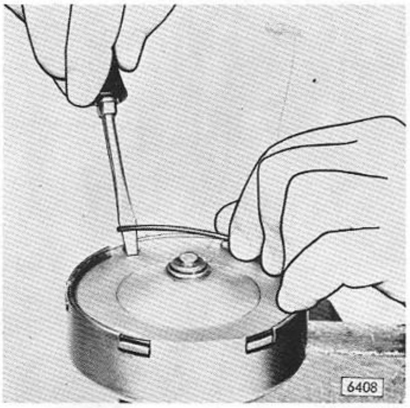


Figure 88

Reassemble friction plate and secure with large retaining ring (see figure 88).

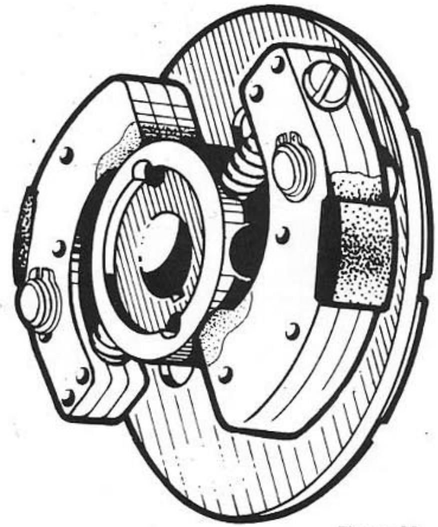


Figure 89

Clutch operating details: Figure 89

Clutch cover drives crankshaft to start engine when handlebar starting lever is pulled.

Centrifugal clutch starts to engage between 1,200—1,500 r.p.m.

Centrifugal clutch is fully engaged between 2,600—3,000 r.p.m.

Centrifugal clutch begins to disengage between 1,400—1,150 r.p.m. (when engine speed is reduced).

Minimum starter clutch lining thickness is .039 in. (1 mm).

Centrifugal clutch must be replaced when linings are worn and limit pins (on shoes) prevent drum contact.

CAUTION: Use only recommended lubricants in transmission or clutch slippage will occur.

ENGINE ASSEMBLING

ASSEMBLING ENGINE:

Lubricate magneto side oil seal and install with sealing lip facing inwards. Oil seals must be fitted straight.

Note: Be certain gap is sufficient [approximately .040 in. (1 mm)] between magento side bearing and oil seal to allow oil flow to bearing. Install crankshaft and clutch assembly in housing half.

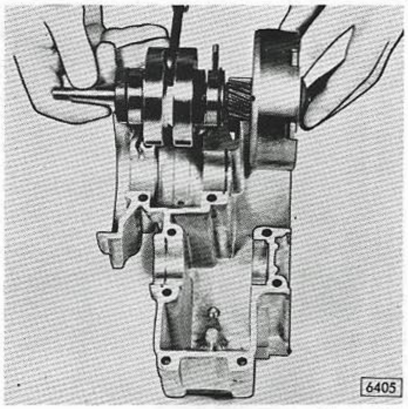


Figure 90

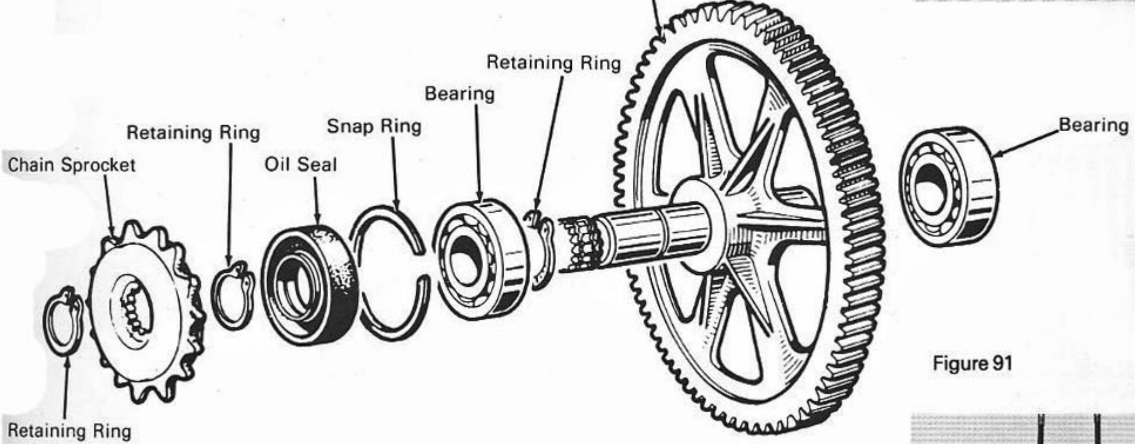


Figure 91

Reassemble primary drive shaft as shown.

CAUTION: Grease oil seal lips before fitting seal.

Reassemble primary drive, lubricate seal and install with sealing lip facing outward. Place assembly in crankcase half.

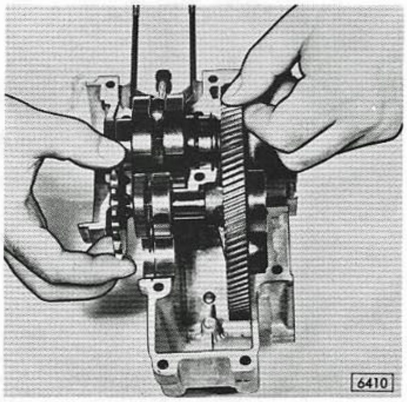


Figure 92

Sparingly apply sealing compound (non-hardening) to crankcase joint, fit crankcase half into place and torque crankcase screws to 6 ft/lb (8 Nm).

Fit clutch cover gasket into place (lightly greased).

Fit clutch cover into place.

NOTE: Clutch activating lever on cover must be preloaded during installation.

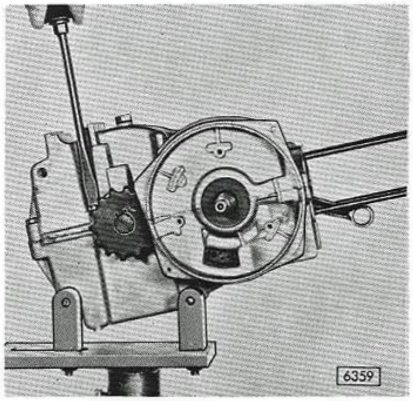


Figure 93

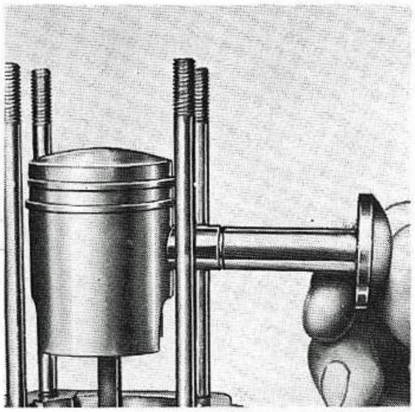


Figure 94

Place engine in upright position, oil small end bushing and install piston. Be certain the arrow on the piston crown and ring locating pins are facing the exhaust (drain plug) side.

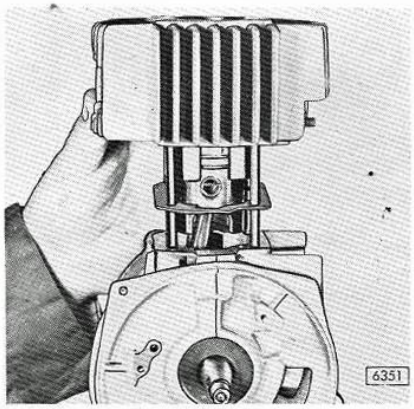


Figure 95

Fit a new cylinder base gasket into place, lightly oil piston and cylinder wall and replace cylinder.

CAUTION: Be sure to align ring gap to their respective locating pins.

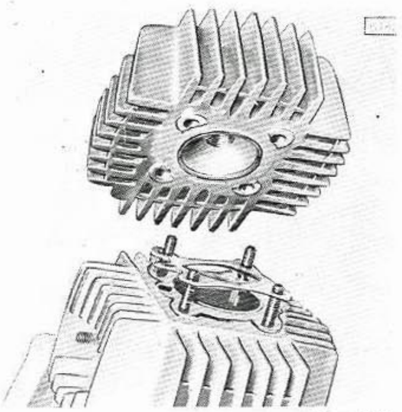


Figure 96

Place cylinder head gasket into position. Fit head, washers and torque cylinder head nuts to 7 ft/lb (10 Nm).

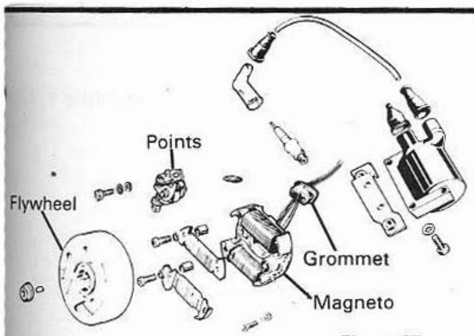


Figure 97

Inspect contact breaker points for burning, pitting or wear and replace if necessary. Inspect coils and wires for cuts or loose connections.

Feed magneto wires through crankcase opening and install base plate assembly, so that the 3 mounting screws are in the center of the slots in the base plate. Push magneto wires through grommet and, using a screwdriver, gently push grommet into place.

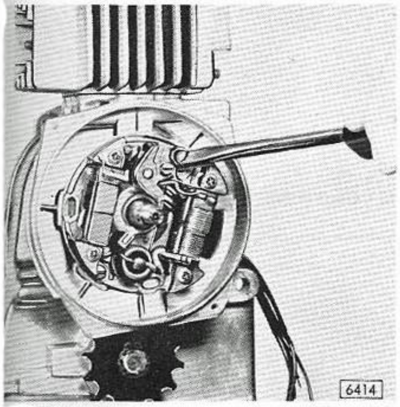


Figure 98

NOTE: Ensure no wires are squeezed between base plate and housing.

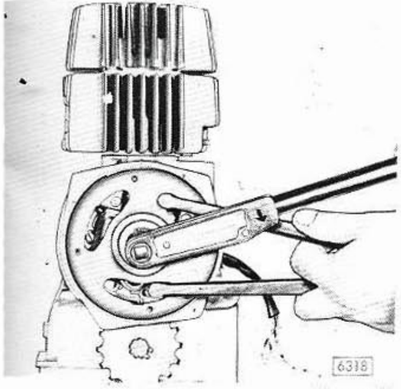


Figure 99

Clean crankshaft taper, fit woodruff key into keyway, install flywheel. Use locking device (P/N 313703) to lock flywheel and torque nut to 25 ft/lb (35 Nm).

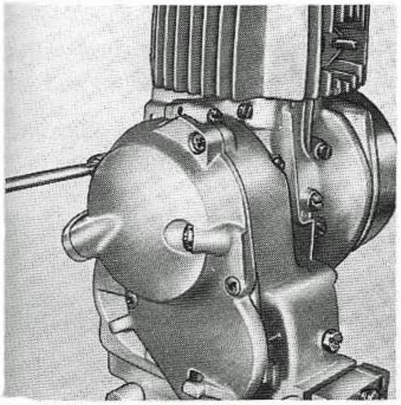


Figure 100

Install a new gasket and replace clutch cover. Torque screws to 6 ft/lb (8 Nm).

ENGINE ASSEMBLING

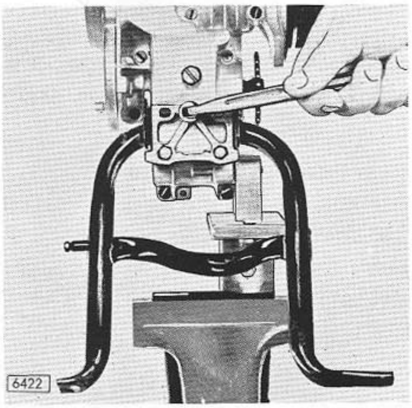


Figure 101

Replace kickstand.

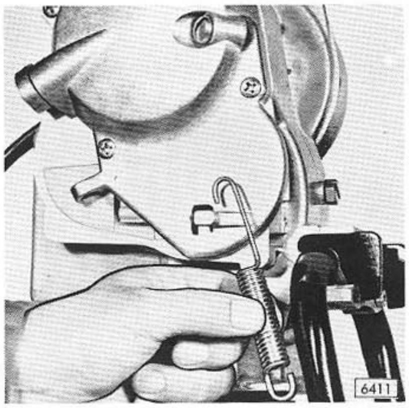


Figure 102

Replace kickstand return spring.

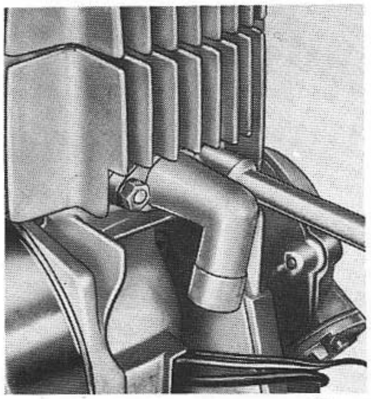


Figure 103

Fit new gasket and intake manifold:

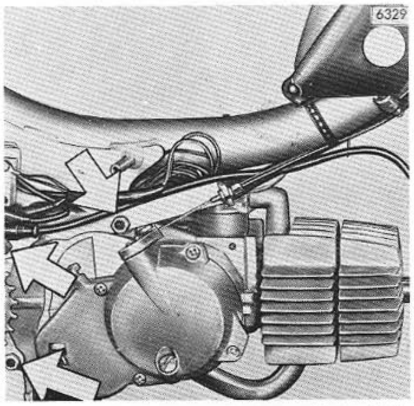


Figure 104

Fit engine into frame from below, and position with thr (3) fixing bolts. Torque engine mounting bolts to 23 ft/ (32 Nm).

NOTE: Fit longest bolt in top front bolt hole.

ENGINE ASSEMBLING

eplace supressor cap (2) onto spark plug.

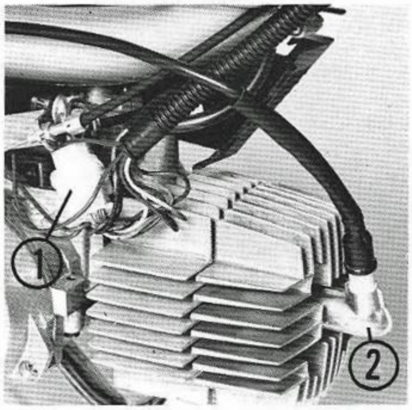


Figure 105

ENGINE-INSTALLATION

place starter cable.

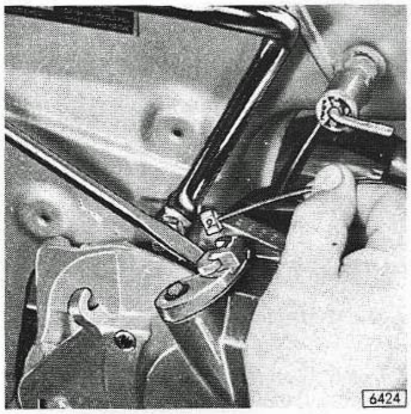


Figure 106

e free play at the starting lever (measured at the end of lever) should be ¾ in. (2 cm). Correct play is achieved by sing th locknut (figure 107/1) and turning the adjuster til the correct lever travel is obtained. Tighten the knut.

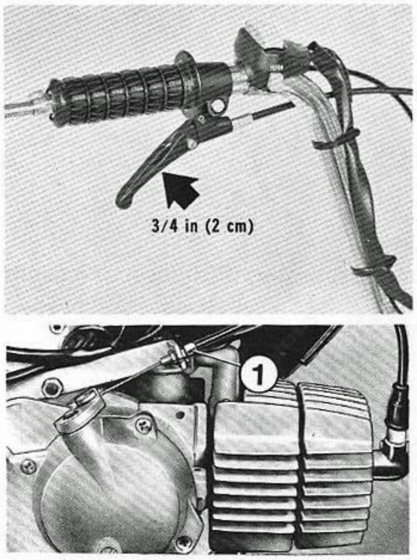


Figure 107

ENGINE-INSTALLATION

Insert wiring pins into plastic connector. Match electrical wire (color to color). See wiring diagram on page 54.

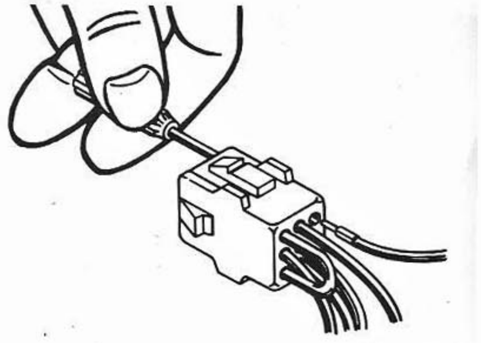


Figure 108

Install drive chain, take care that the connecting link is properly placed with the closed end pointing in the direction of chain travel. The proper slack of the drive chain should be ¾". To adjust the chains, loosen the axle nuts and tighten or loosen the rear adjuster nuts. Once chains are properly adjusted, tighten the axle nuts. Make sure that wheels are always aligned.

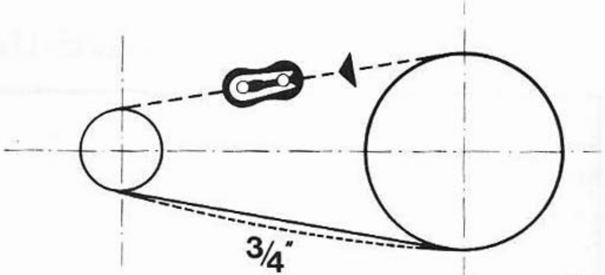


Figure 109

Fit a new exhaust gasket and replace exhaust system.

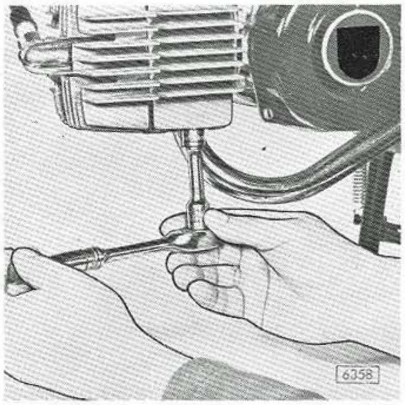


Figure 110

Replace carburetor, air filter and gasoline line.

CAUTION: Push carburetor completely forward on manifold to prevent air leak.

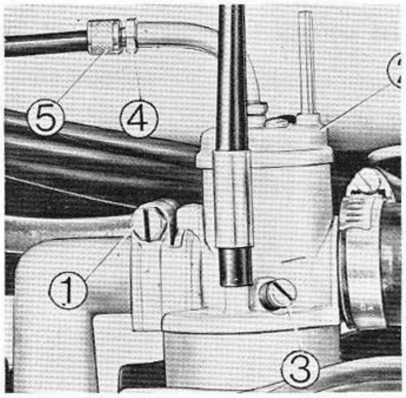


Figure 111

ENGINE-INSTALLATION

Remove filler plug (figure 112/1 and fill gear box with Type "F" automatic transmission fluid (approximately 5-3/4 oz. - 170 cc) until fluid is level with filler hole.

CAUTION: Any Use only Type "F" transmission fluid. Other types of oil may dissolve clutch friction material.

Replace both left and right chain guards.

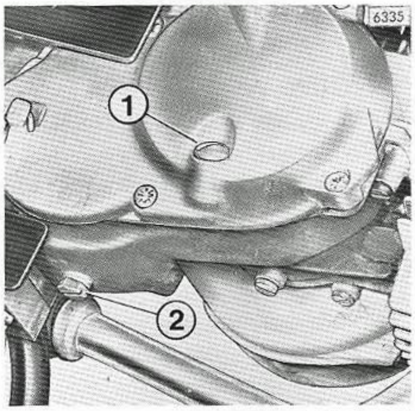


Figure 112

CLUTCH SHAFT REMOVAL & ASSEMBLY

CLUTCH LEVER AND SHAFT

Drain transmission fluid, remove kickstand spring, and clutch cover. Remove upper retaining ring (1), clutch lever (2), lower retaining ring, (3), seal ring (4) and spring (5). After removing the clutch shaft (6) check housing and shaft for excessive wear. Always replace "O" ring (7) and seal ring (4) when reassembling.

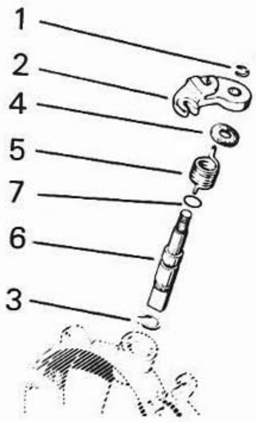


Figure 113

Use reverse procedure on re-assembling the shaft. When fitting the starter lever, be sure the lever is installed correctly. Before the starter clutches engages fully, the lever should form a right angle with the starter cable.

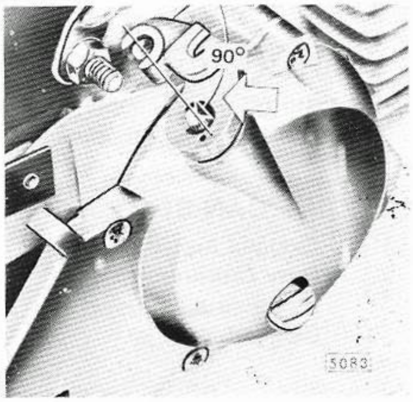


Figure 114

TROUBLE SHOOTING

TROUBLE SHOOTING CHECK CHART

ENGINE WON'T START

1. Check fuel system (valve, carburetor, fuel line) for adequate fuel and proper operation.
2. Check ignition for spark
3. Check engine compression by pulling starter lever and crank engine slowly

NO SPARK

1. Faulty ignition coil
2. Faulty breaker points or condenser
3. Faulty spark plug
4. Faulty suppressor
5. Leaking leads or connections (switches, ignition coil, ground wire)

ENGINE KICKS BACK AND BACKFIRES

1. Improper timing
2. Faulty breaker points or condenser
3. Flywheel key sheared, or missing

DIFFICULT TO START FROM COLD

1. Choke not working
2. Improper timing
3. Spark plug improperly gapped
4. Spark plug wrong heat range
5. Wrong suppressor (suppressor for vehicle 1 ko resistance)

EXCESSIVE FUEL CONSUMPTION

1. Choke working all the time
2. Carburetor flooding (float valve leaky)
3. Leakage in fuel line

NO POWER

1. Faulty carburetor
2. Improper timing
3. Worn out cylinder and piston
4. Leaky oil seal on crankshaft
5. Choke sticking

STARTER CLUTCH DOES NOT RELEASE

1. Starter control cable incorrectly adjusted
2. Leaky oil seal on crankshaft

ENGINE CAN BE STARTED BY CHOKING, BUT DIES WHEN CHOKE NOT USED

1. Clogged fuel line
2. Dirty carburetor
3. Contaminated fuel
4. Clogged main jet

TROUBLE SHOOTING

LOW SPEED MISS - DOES NOT IDLE SMOOTHLY

1. Defective spark plug
2. Leaking crankshaft seal
3. Improper ignition timing
4. Spark plug improperly gapped
5. Burnt or worn breaker points

HIGH SPEED MISS

1. Spark plug of wrong heat range
2. Improper ignition timing
3. Leaking head gasket
4. Exhaust port clogged
5. Exhaust system clogged
6. Improper breaker point gap

POOR ACCELERATION - LOW R.P.M.

1. Inlet needle and seat leaking or sticking
2. Timing out of adjustment
3. Improperly gapped spark plugs

ENGINE SEIZES (STOPS SUDDENLY)

1. No lubrication in gas
2. Rod on main bearing seized
3. Cylinder or piston scored or seized

VIBRATES EXCESSIVELY OR RUNS ROUGH AND SMOKES

1. Idle or high speed mixture too rich
2. Engine mounts loose

SECTION III

FUEL SYSTEM AND CARBURETOR

CARBURETOR

CARBURETOR OPERATION TROUBLE SHOOTING TIPS

(The numbers quoted in the brackets refer to the illustration on page 49.)

The carburetor on your unit is a Bing variable venturi (slide type) carburetor. The term variable venturi comes from the fact that the slide varies the amount of the restriction of air through the throat of the carburetor and the term venturi denotes a restriction in an air passage.

The components in the carburetor are simple. Please, refer to the accompanying drawing for identification of each part number. The slide (ref. no. 11) is attached to a cable which is operated by the twist grip on the handlebar. Turning the twist grip either raises or lowers the slide and this in turn either increases or decreases the amount of air allowed to flow through the throat of the carburetor.

Protruding from the bottom of the slide is a tapered rod or "needle" (ref. no. 10). Its position in relation to the slide is determined by a small clip (ref. no. 9) which is inserted in one of four grooves at the top of the needle. This clip then rests on the inside of the bottom of the slide.

Underneath the slide in the body of the carburetor is a brass tube with a carefully selected inside diameter. This tube is called a "needle jet" (ref. no. 13). The needle hanging out of the slide hangs down into this needle jet.

Threaded into the bottom of the needle jet is a small brass plug called the "main jet" (ref. no. 14). The main jet has a precisely drilled passage through it and is available in various sizes.

At the bottom of the carburetor is a removable aluminum fuel reservoir called the "float bowl" (ref. no. 19). The float bowl threads onto the base of the carburetor body. Inside the float bowl is a styrofoam ring which is called the "float" (ref. no. 17). There is a small brass arm attached to the float on one end and pinned to the carburetor on the other by the float pin (ref. no. 16). Underneath this arm is a steel "inlet needle" (ref. no. 15) which is inserted into a "needle seat" in the carburetor body.

The method of operation is as follows:

1. When the float bowl is empty and the fuel valve on the fuel tank is opened, fuel flows through the fuel line and into the carburetor through the inlet banjo (ref. no. 20-22) and the filter screen (ref. no. 20a) to the top of the inlet needle. Because the float bowl is empty, the float is hanging down and the needle is off its seat allowing fuel to enter the bowl. As the bowl fills, the float rises to a predetermined level at which point the needle presses against its seat and the flow of the fuel is stopped. As fuel is consumed by the engine the float goes up and down to maintain a constant level of fuel in the float bowl.

2. In order to start a cold engine a very rich fuel air mixture is required. (A rich mixture would be 1 part of fuel to 5 parts of air or 5 : 1.) This can be accomplished by either increasing the amount of fuel or decreasing the amount of air. In the Bing carburetor there is a choke plate (ref. no. 25) which when pushed down cuts off most of the airflow through the throat of the carburetor and thus creates a very rich mixture.

When the engine starts and the throttle is opened, the slide pushes the choke plate up out of the carburetor throat removing the restriction.

3. Since the airflow at each throttle opening position is always constant, a means must be provided to obtain the proper amount of fuel for the right mixture. (The running mixture is 1 part of fuel to 50 parts of air or 50 :1). From idle to approximately ¾ throttle the fuel supply is determined by the needle jet.

   If the fuel mixture is too lean (not enough fuel) the clip on the needle should be lowered one notch in order to raise the needle farther out of the needle jet. This will result in more fuel being discharged at each throttle open position from idle to ¾ throttle.

   If the fuel mixture is too rich (too much fuel) the clip on the needle should be raised one notch in order to lower the needle into the needle jet. This will result in less fuel being discharged at each throttle open position from idle to ¾ throttle.

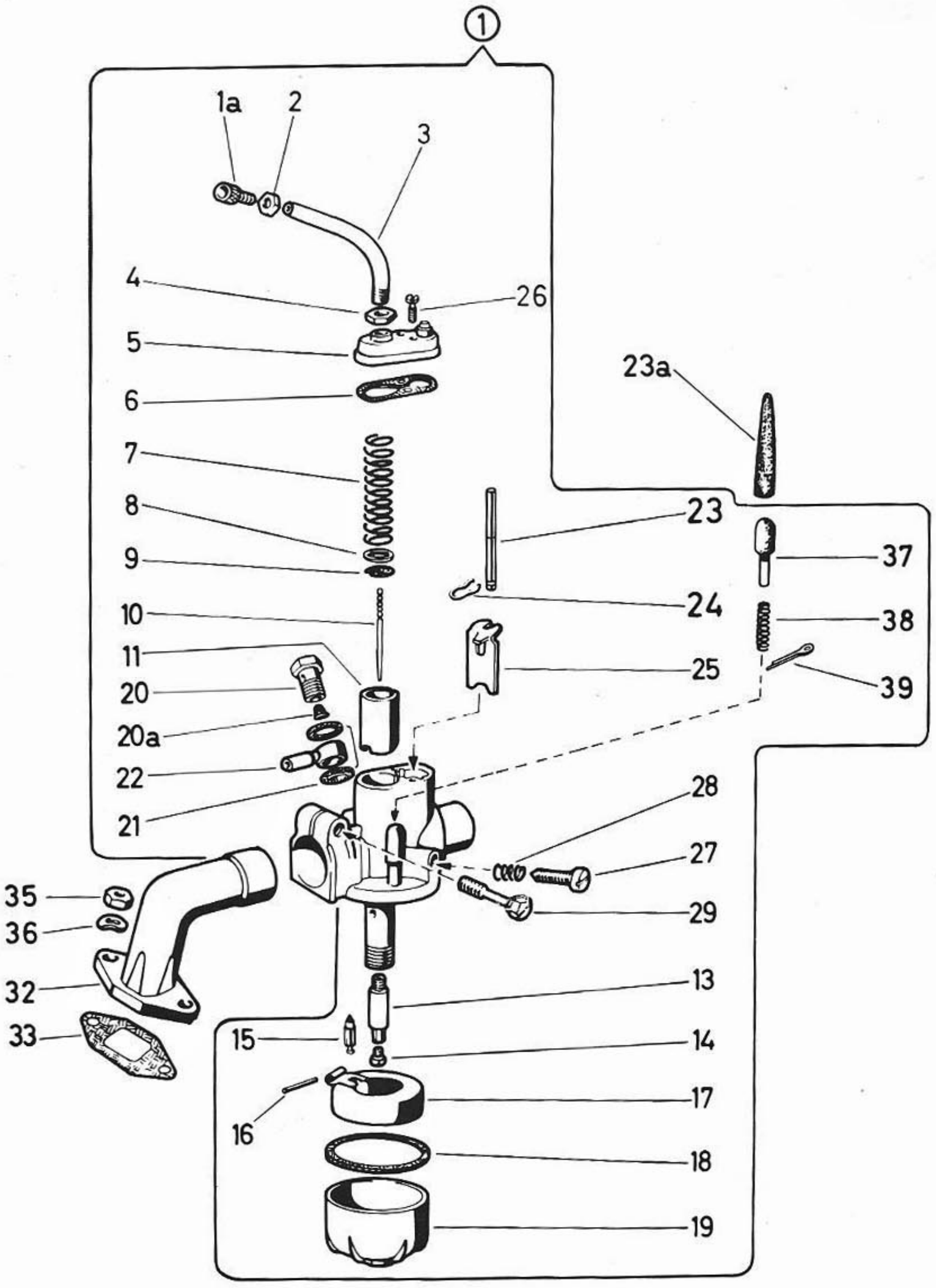
CARBURETOR

From ¾ to full throttle the fuel supply is determined by the size of the main jet. A larger main jet will richen the mixture from ¾ to full throttle and a smaller main jet will lean the mixture in the same range.

Needle setting and size of main jet are fixed at the factory and must not be changed.

The setting of the float can also have and effect on the mixture. If the float is too far from the bottom of the carburetor when the needle closes the fuel reserve will be limited and the engine could run lean. If the float is too close to the carburetor body when the needle closes, the engine could run too rich and/or the carburetor could flood.

To properly set the float level remove the float bowl and invert the carburetor. The float is properly adjusted when the top edge of the float is parallel with the gasket surface of the float bowl on the carburetor body. This setting is very important and should always be checked when mixture problems are encountered.



CARBURETOR

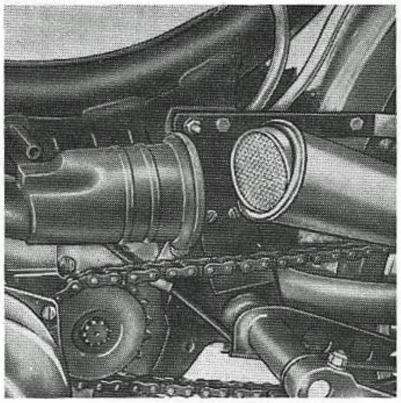


Figure 115

The carburetor fitted to the engine is tuned to specifications established by intensive factory research and should not be altered in any way.

Dismantle carburetor, clean all components and reassemble. See page 49.

Before installing carburetor, wash air cleaner filter with gasoline or similar cleaning material, blow completely dry with compressed air and spray filter element lightly with engine oil.

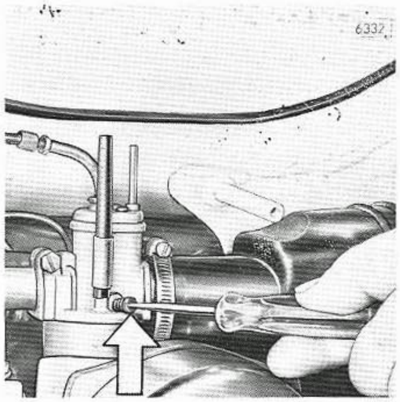


Figure 116

Install carburetor and air cleaner.

Start engine and run at moderate speed until operating temperature is reached.

IDLE ADJUSTMENT

Start engine and run at moderate speed until operating temperature is reached. Adjust idle speed by turning idle adjustment screw in or out until engine runs smoothly.

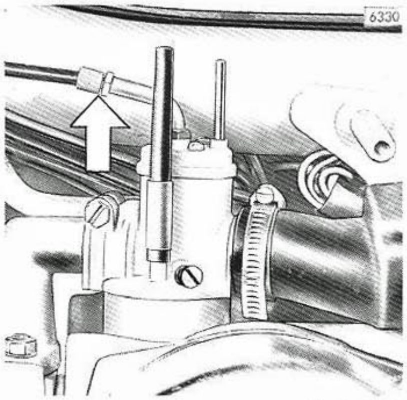


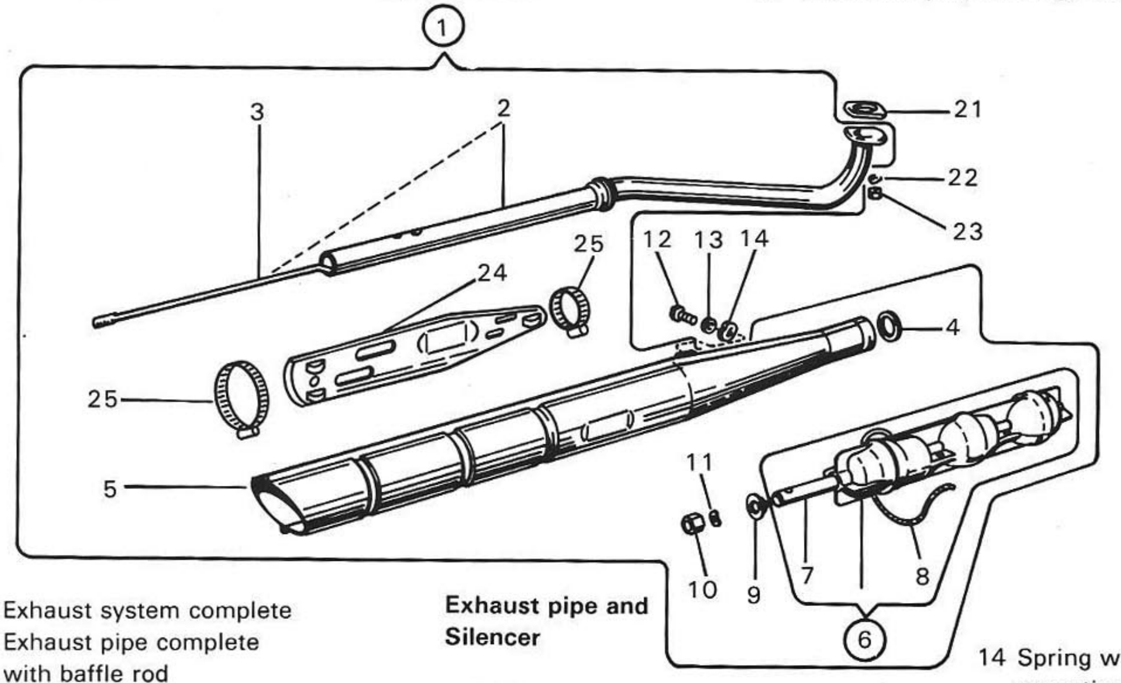
Figure 117

THROTTLE CABLE ADJUSTMENT

Check for proper throttle cable slack (.040 in/1.0 mm). Insufficient cable slack will hold the throttle partially open and the idle adjusting screw will not function. If necessary, loosen the cable locknut and turn the throttle cable adjuster to the right to increase cable slack. Retighten the cable locknut.

TROUBLE SHOOTING-FUEL SYSTEM AND CARBURETION

Symptom	Reason/s	Remedy
Excessive fuel consumption	1. Air cleaner choked or restricted	1. Clean.
	2. Fuel leaking from carburetor.	2. Check all unions and gaskets.
	3. Float sticking	3. Float needle seat needs cleaning.
	4. Badly worn or distorted carburetor	4. Replace.
	5. Carburetor incorrectly adjusted	5. Tune and adjust as necessary.
	6. Incorrect silencer fitted to exhaust system	6. Do not deviate from manufacturer's original silencer design.
Idling speed too high	1. Throttle stop screw in too far	1. Adjust screw.
Engine does not respond to throttle	2. Carburetor top loose	2. Tighten top.
	3. Back pressure in silencer	3. Check baffles in silencer.
	4. Float displaced or punctured	4. Check whether float is correctly located or has petrol inside.
	5. Use of incorrect silencer or baffles missing	5. See above. Do not run without baffles.
Engine dies after running for a short while	1. Blocked air hole in filler cap.	1. Clean.
	2. Dirt or water in carburetor	2. Remove and clean out.
General lack of performance	1. Weak mixture; float needle stuck in seat	1. Remove float chamber or float and clean.
	2. Air leak at carburetor joint or in crankcase	2. Check joints to eliminate leakage.
Excessive white smoke from exhaust	1. Too much oil in fuel mixture, or oil	1. Mix in recommended ratio only.
	1. has separated out	1. Mix thoroughly if mixing pump not available.



Exhaust pipe and Silencer

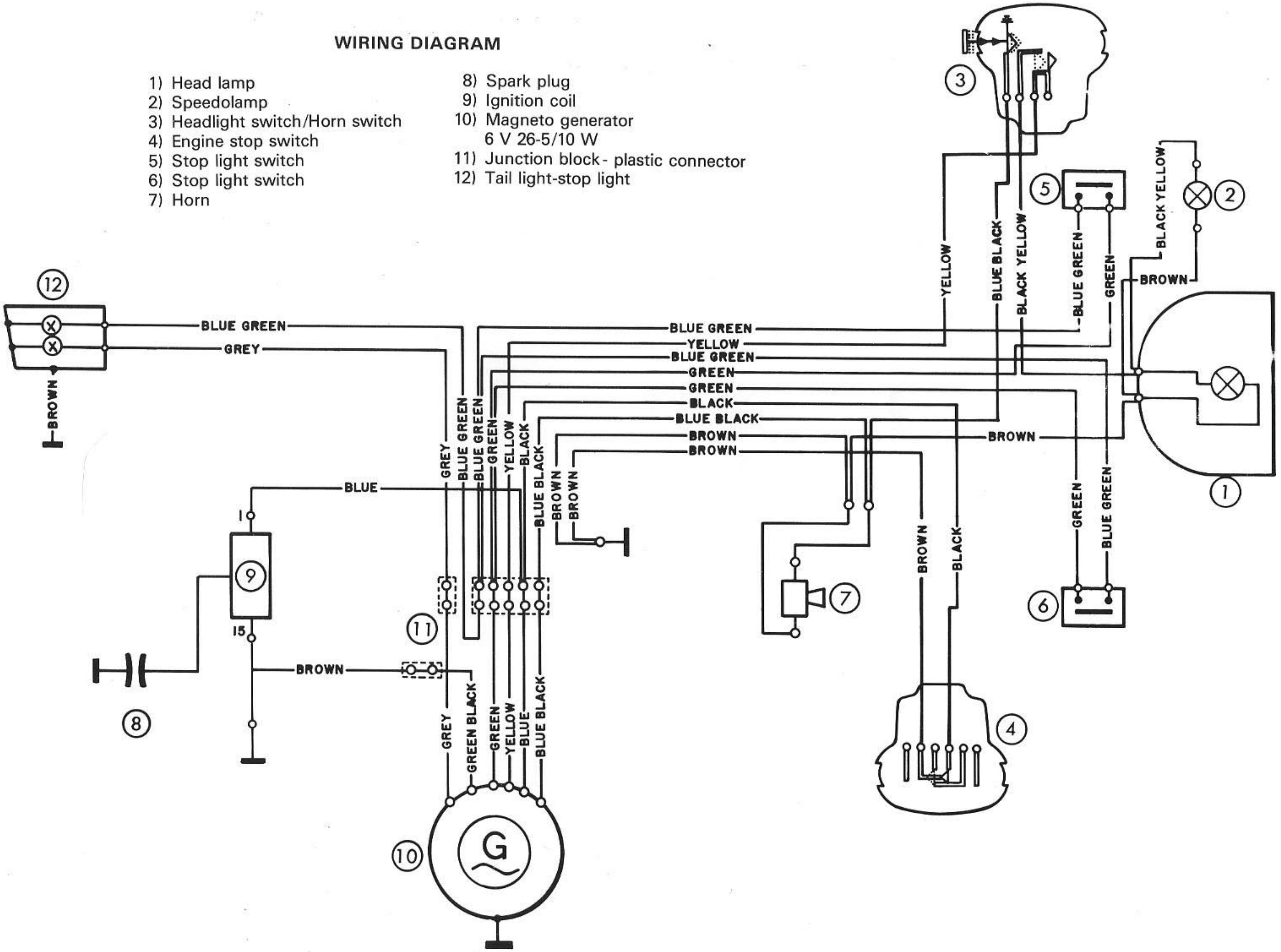
Exhaust system complete
2 Exhaust pipe complete with baffle rod
3 Baffle rod
4 Sealing ring
5 Silencer cover
6 Baffle assembly
7 Tail pipe
8 Asbestos cord
9 Washer for baffle rod
10 Nuts for baffle rod—2 off
11 Belville washers for baffle rod
12 Bolt for mounting bracket
13 Washer for mounting bracket bolt
14 Spring washer for mounting bracket bolt
21 Exhaust flange gasket
22 Belville washers for flange studs—2 off
23 Nuts for flange studs—2 off
24 Heat Shield
25 Clamp

SECTION IV

ELECTRICAL SYSTEM

WIRING DIAGRAM

1) Head lamp
2) Speedolamp
3) Headlight switch/Horn switch
4) Engine stop switch
5) Stop light switch
6) Stop light switch
7) Horn
8) Spark plug
9) Ignition coil
10) Magneto generator
    6 V 26-5/10 W
11) Junction block - plastic connector
12) Tail light-stop light



ELECTRICAL EQUIPMENT

FLYWHEEL MAGNETO

5216

Consists of the base plate assembly and the flywheel.

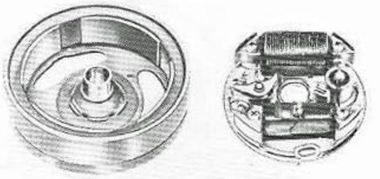


Figure 118

IGNITION FUNCTION

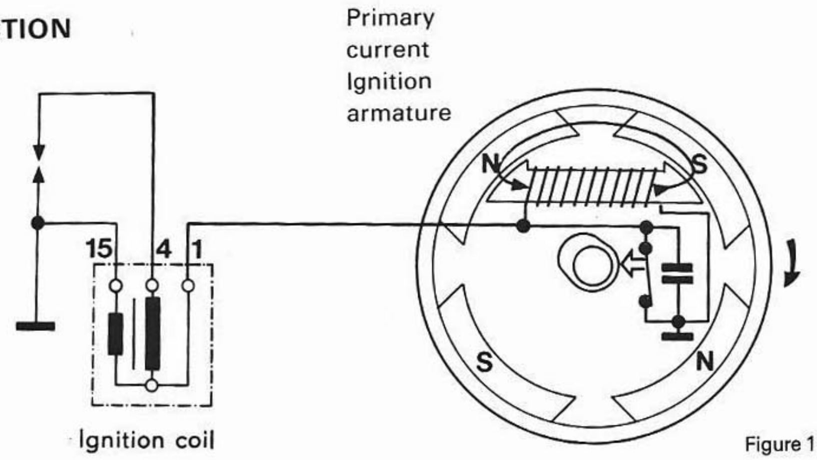


Figure 119

As the flywheel turns, a large number of reverses of magnetic flux is induced in the primary current ignition armature. When the breaker points are closed, as in Figure 119, an induced current flows in the ignition armature of the magneto.

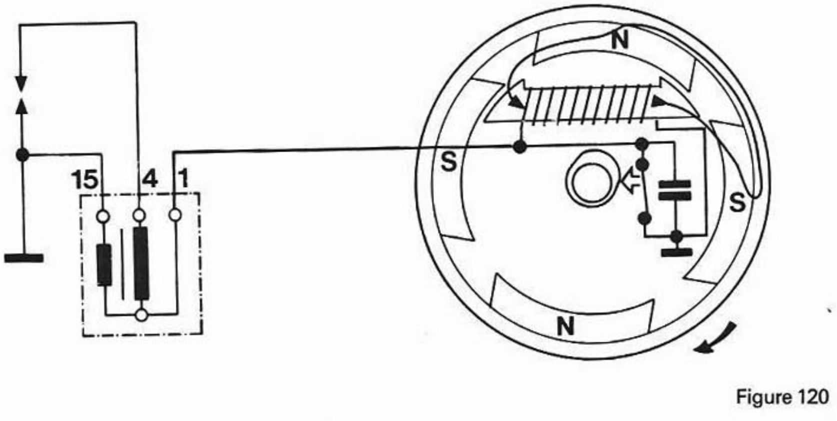


Figure 120

In Figure 120 the current in the ignition armature is at its greatest value.

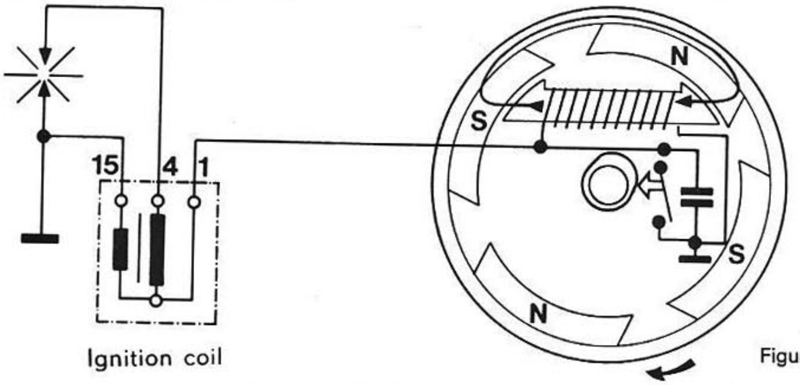


Figure 121

At that point the contact points open and the magnetic flux in the armature core immediately reverses direction, sending current from the magneto armature to the primary side of the external ignition coil. This induces a high voltage in a secondary winding of the ignition coil, which generates a spark at the spark plug electrode.

NOTE: The condenser connected parallel to the contact breaker, prevents the formation of a spark at the breake contacts.

LIGHTING FUNCTION

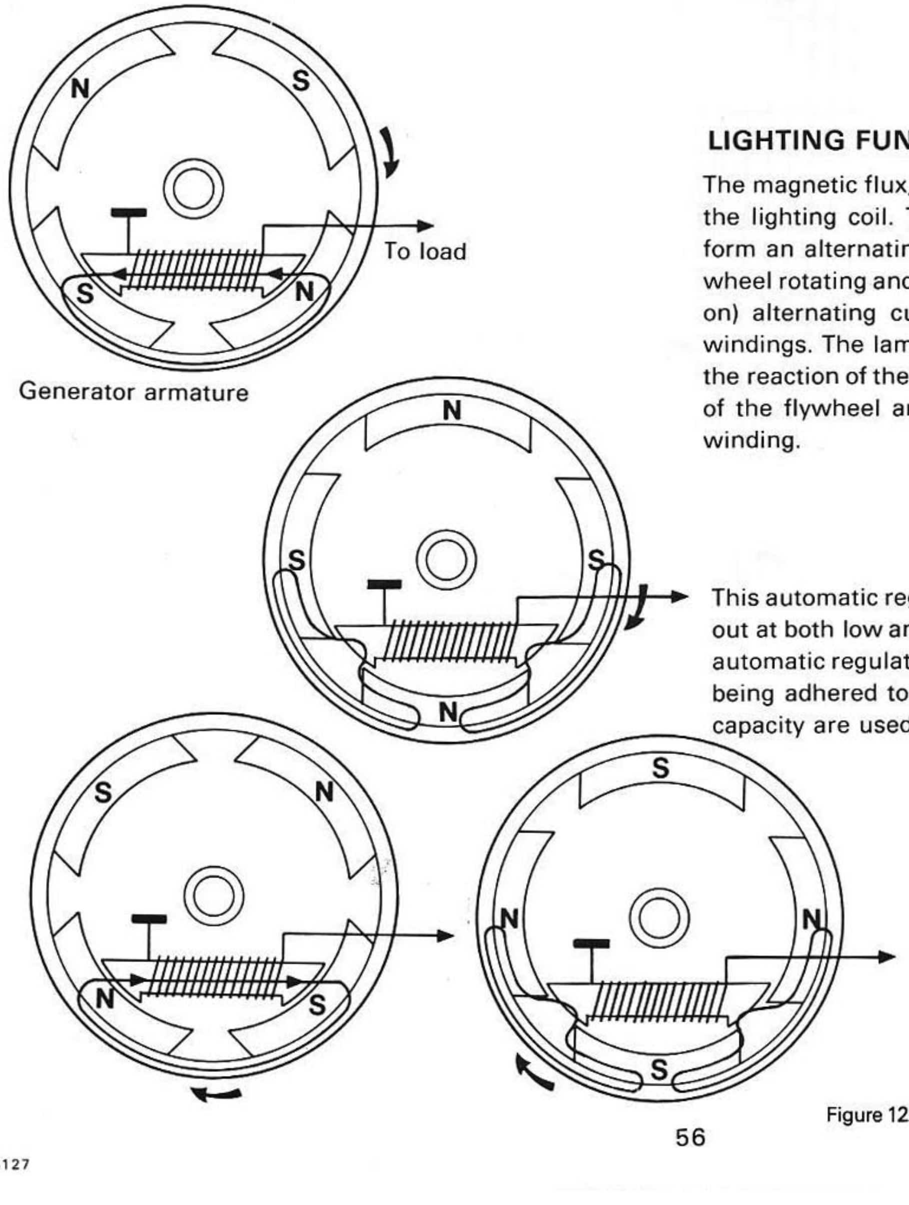


Figure 122

LIGHTING FUNCTION

The magnetic flux, generated by the flywheel, also passes the lighting coil. The flywheel and lighting coil togethe form an alternating - current generator, i.e. with the flywheel rotating and the circuit closed (bulbs being switched on) alternating current will flow thru the lighting coil windings. The lamp voltage is regulated automatically by the reaction of the alternating current to the magnetic flux of the flywheel and the voltage drop in the lighting coil winding.

This automatic regulation prevents the bulbs from burning out at both low and high engine revolutions. However, the automatic regulation is only effective if the specified load is being adhered to, i.e. if bulbs with specified voltage and capacity are used.

BREAKER POINTS

Breaker points gap

Burned or worn breaker points must be replaced with new ones.

Turn flywheel until the fully opened breaker contacts are visible thru one of the flywheel windows.

Since breaker points wear after operation and the gap reduces, the gap of new points should be adjusted to at least .018 in. (0.45 mm).

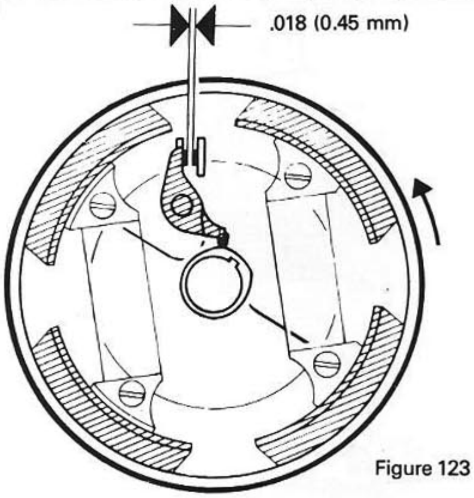


Figure 123

If lighting coil/s has/have been replaced, measure air gap between coil pole shoes and flywheel. Gap should be .016-.024 in. (0.40-0.60 mm). If gap is incorrect, loosen coil mounting screw and adjust as necessary.

CAUTION: Always check and adjust ignition timing if flywheel has been removed.

Coil resistances in ohms:

Tail lamp	6.7
Stop lamp	1.16
Head lamp	0.23

Ignition coil:

Primary	2
Secondary	5.4

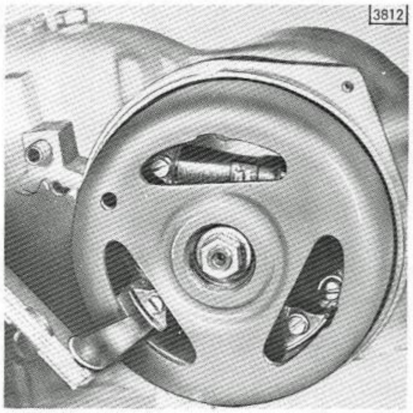


Figure 124

Adjusting breaker points

Rotate flywheel until fully opened point gap is visible thru one of the flywheel windows. Loosen fixing screw and adjust point gap to

.014 — .018 in. (0.35 — 0.45 mm)

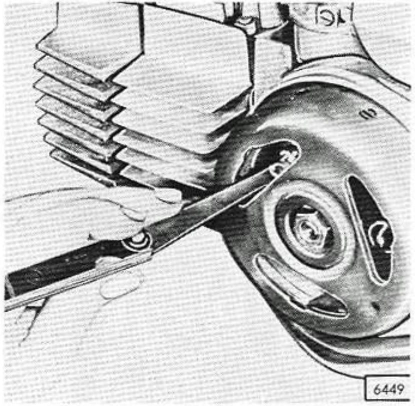


Figure 125

Replacing the breaker points

As already mentioned, points must be replaced if

a) They are burned or worn
b) Fiber block is worn or loose
c) Bearing bush is worn or loose
) Spring is loose
e) Fixed contact or moving contact are bent.

Unscrew cable at the breaker and remove fixing screw.

Replace point set.

When fitting new points be sure the contact surfaces are free from grease or oil.

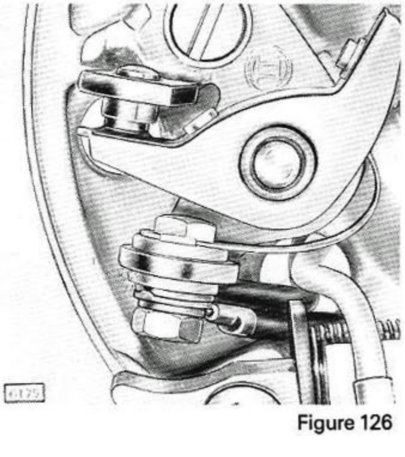


Figure 126

IGNITION TIMING

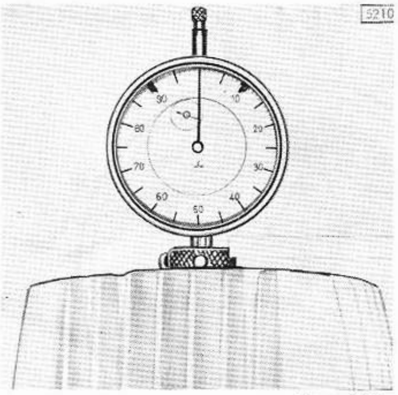


Figure 127

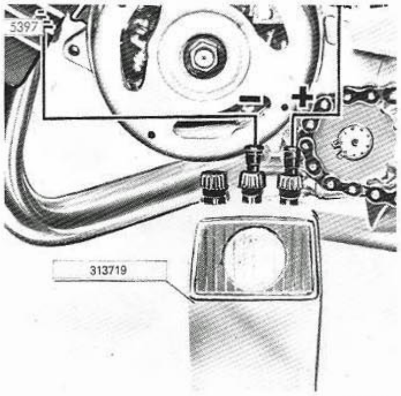


Figure 128

Ignition timing:

The engine output depends on correct ignition timing. Too far advanced ignition causes the engine to knock and too far retarded ignition reduces output. In both cases the engine overheats.

Necessary for proper adjustment:

1 Dial indicator (commercial)
1 Dial indicator adapter part no. 313720
1 Ignition timing device part no. 313719

a) Remove spark plug
b) Screw adapter no. 313720 with dial indicator into spark plug thread of cylinder head.
c) Connect one cable of the timing device no. 313719 to the blue lead and the other to ground.

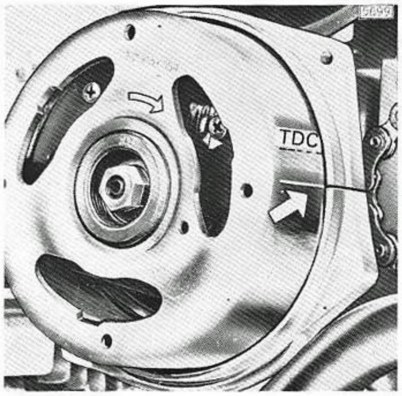


Figure 129

Turn flywheel clockwise until dial indicator registers T.D.C. (Top Dead Center) of piston travel. Set dial indicator gauge to zero. Turn flywheel in engine direction (see arrow on flywheel-Figure 129) till the buzzing noise on the timing device alters. The ignition timing mark on the flywheel should coincide with the parting line of the two housing halves. Recheck breaker point gap or re-adjust if the timing is not correct, check to be sure that the base plate assembly has been correctly installed.

FITTING NEW FLYWHEEL (WITHOUT TIMING MARK):

Adjust breaker point gap to correct setting. To find T.D.C. of piston travel, insert a dial indicator into the plug hold (with holder). Find T.D.C. with zero dial indicator and turn engine .015 - .067 in. (1.3 - 1.7 mm) measured on the dial indicator, backward (against engine direction) and mark flywheel in line with the parting line of the two housing halves. This is the ignition timing mark. Re-check ignition as described on previous page.

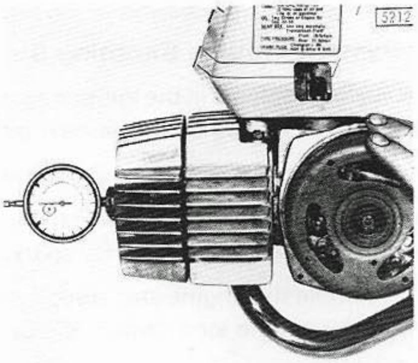


Figure 130

ADJUST IGNITION TIMING WITH UNMARKED FLYWHEEL

(without dial indicator)

Adjust breaker point gap to correct setting. Find T.D.C. of piston travel (insert a drift into plug hole). Make a pencil mark on the flywheel at the parting line of the two housing halves. From that pencil mark measure .728- .827 in. (18.5 - 21.0 mm) forward on flywheel (in engine direction) and mark the flywheel. This is ignition mark as shown by arrow in Figure 131. Re-check ignition timing as described on previous page.

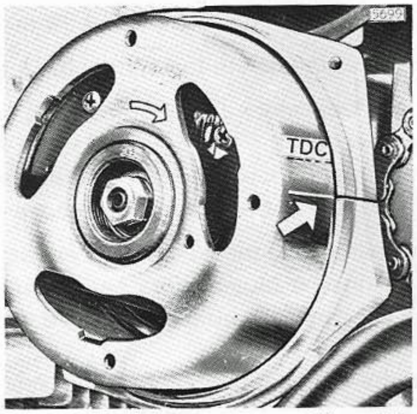


Figure 131

TROUBLE SHOOTING

Ignition System Trouble Shooting Suggestions

When looking for problems in the ignition system, it is quickest and easiest to check and eliminate each item in the system completely before passing on to the next item.

The following sequence of checks should be helpful in finding the source of ignition problems.

1. Replace the spark plug. A spark plug that fires when laid against the cylinder head may not fire when subjected to engine compression. Check for spark.
2. Disassemble the engine stop switch, separating the two parts of the plastic housing. This eliminates the possibility of a faulty engine stop switch. Check for spark.
3. Verify the connections of the blue wire in terminal 6 and both ends of the ground wire in terminal 5. If faulty, repair and check for spark.
4. Unscrew the spark plug wire from the ignition coil and inspect the wire end visually to see if the screw in the terminal has been in contact with the copper wire in the core. If not, repair and check for spark.
5. Check resistance in the spark plug suppressor using an Ohmmeter (should be 1,000 Ohm resistance).
6. Obtain from stock a new ignition coil. Install the spark plug wire and the blue and brown wires from the old coil into the new coil.
   Attach to spark plug and check for spark.
   NOTE: It is not necessary to remove old coil to perform this test.
7. Remove the magneto cover and extract the flywheel. Inspect the condition of the breaker points. If there are signs of arcing (e. g. blued points, carbon colored spots, etc.) the condensor is probably faulty and both the breaker points and condensor should be replaced. (When replacing the breaker points and condensor follow steps 8 and 9 as well.)
   Retime the engine and check for spark.
8. Remove the engine backing plate and check the wiring behind the plate for pinched, broken or bare wires. Reassemble and retime the engine. Check for spark.
9. Insert a piece of cardboard (e. g. a matchbook cover) between the breaker point faces to insulate them. Attach one lead of a Ohmmeter to the wire terminal on the generating coil. Attach the other lead to a suitable ground on the ignition backing plate. The generating coil internal resistance should be 1.25 Ohm. If the coil is defective there will be a high resistance reading or an open circuit. Replace coil, retime engine and check for spark.
   NOTE: All electrical connections should be made using a resin core, electrical type solder. Acid core solder will cause a repeat failure.

SECTION V

FRAME, FORK ASSEMBLY AND REAR SWING ARMS

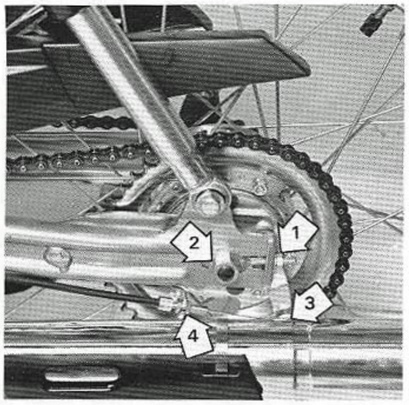


Figure 132

REAR SWING ARM

Remove engine according to repair manual.

Remove rear axle nuts (figure 132/2), loosen chain adjusters (figure 132/1), disconnect rear brake cable (figure 132/3) and remove wheel.

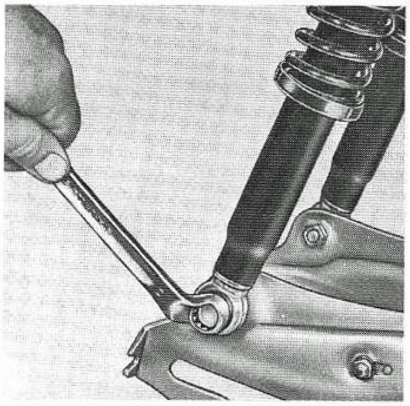


Figure 133

Unscrew rear lower shocker mounting bolts.

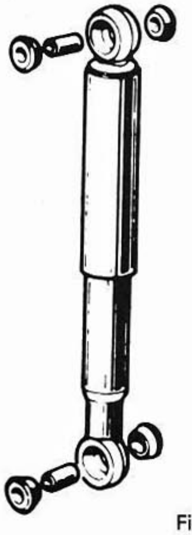


Figure 134

SHOCK ABSORBERS

Shock absorbers are not serviceable.

No spare parts are available and faulty suspension units must be replaced.

REAR SWING ARM

Remove the four (4) retaining bolts and remove bearing cup, rear fork and rubber bearing.

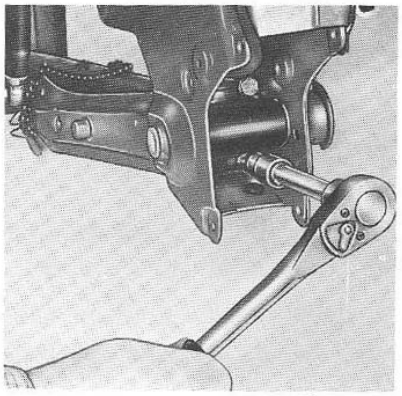


Figure 135

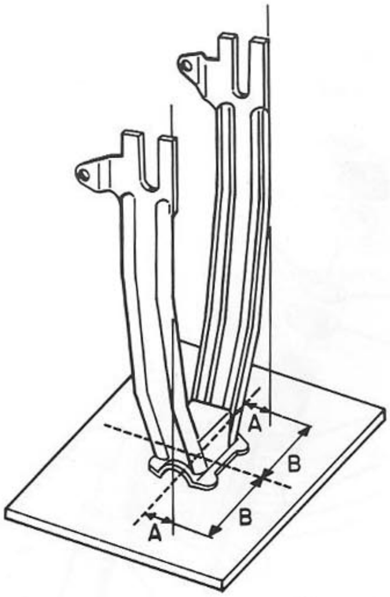


Figure 136

CHECKING THE SWING ARM

Fix bearing flange of swing arm on a straightening plate. As shown in Figure 136, mark center line. The difference of the measurements shows the distortion of the swing arm.

If no difference is measured the swing arm bearing of the frame is distorted. A distorted frame cannot be aligned but must be replaced. Further, check swing arm rubber bush and both plastic bushes of pedal shaft.

FITTING THE SWING ARM

Proceed in reversed order to dismantling. Note, that the 4 bearing ring screws are tightened only after fitting the shocks units to prevent excessive prestressing of rubber mountings (excess wear).

Torque to 29 ft/lb (40 Nm).

FRONT FORK

Figure 137

DISMANTLE FRONT FORK

Unscrew front brake cable and speedometer drive cable. Screw both axle nuts and remove front wheel. Remove front fender and headlamp. Remove the two (2) top bridge hex bolts.

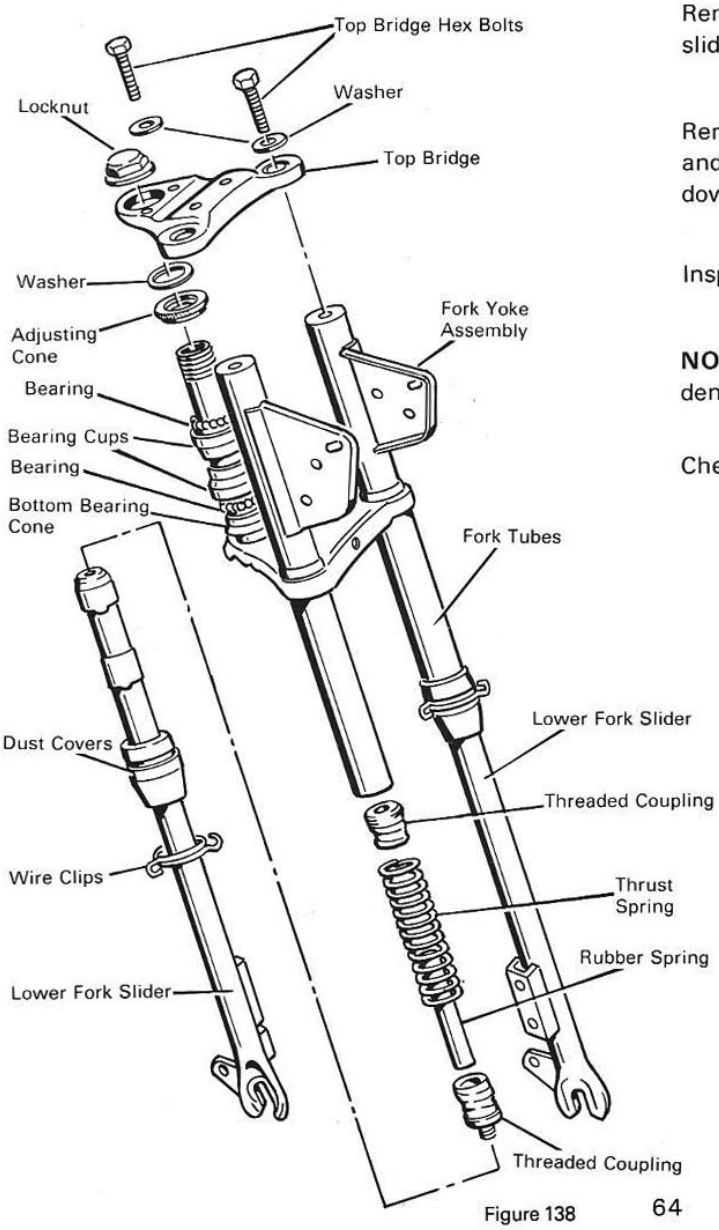


Figure 138

Remove wire clips from dust covers. Pull both lower fork slider assemblies down and out of fork tubes.

Remove lock nut, lift off top bridge and handlebar assembl and lay on top of gas tank. Remove adjusting cone and pul down fork yoke assembly.

Inspect all parts and replace if necessary.

NOTE: Replace bearing cups and bearing cones if pitted or dented. Inspect fork assembly for bends and twists.

Check springs for wear and replace if weak.

Spring Dimensions:

Spring length

New: 7.240 in. (184 mm)

Limit: 6.900 in. (175 mm)

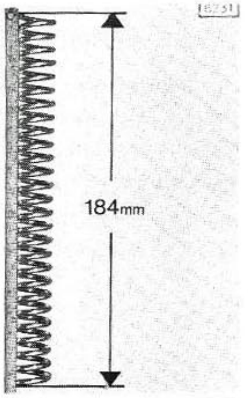


Figure 139

FRONT FORK

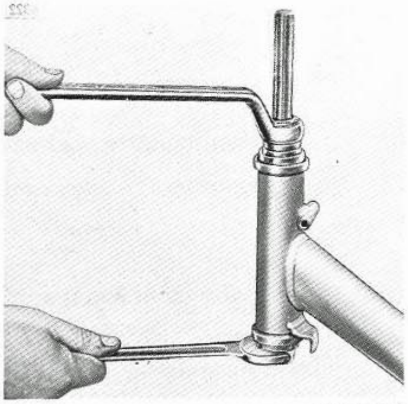


Figure 140

The frame is made of tubular steel and repairs must be limited to replacement of worn head bearings.

Serious bends, cracks or other accidental damage cannot be repaired without weakening the frame. Impaired steering or wheel misalignment are indications of a twisted or damaged frame.

Knock out steering head bearing cups and install with special tool (P/N 313729).

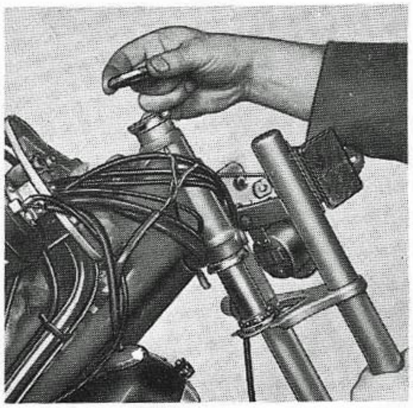


Figure 141

Lubricate both bearing cones and cups and install fork yoke.

NOTE: Do not overtighten adjusting cone, front fork must turn easy with no noticeable play.

CAUTION: The bearings must be adjusted before riding or a loss of steering may result causing an accident. See page 66 for proper bearing adjustment.

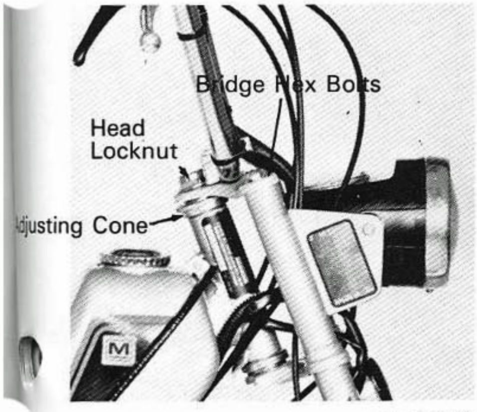


Figure 142

Replace top fork bridge and secure with head locknut.

Note drawing on page 64. Reassemble lower fork sliders and springs. Secure dust covers to fork tubes with wire clips.

Reassemble the two top bridge hex bolts.

Torque bridge bolts to 9 ft/lb (12 Nm).

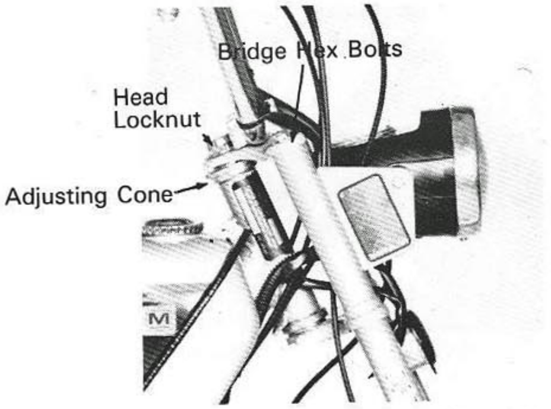


Figure 143

Install headlamp, front fender and front wheel.

HEAD BEARING ADJUSTMENT

Proper bearing adjustment should allow the fork to pivot freely with the tire held off the ground. The fork should never rattle or move vertically in the frame head tube. If adjustment is necessary, proceed as follows:

Loosen head locknut (see figure 143). Tighten adjusting cone tightly by hand only.

Hold bearing cone in place and tighten head locknut securely. Check fork for proper adjustment.

If further adjustment is necessary, repeat procedure.

ADJUSTING THE HEADLIGHT

Place the unit on level ground at a distance of 16 feet (5m) from a vertical wall with the rider seated on the machine. Chalk on the wall a vertical line (C) corresponding to the center of the machine and a horizontal crossing line (H) corresponding to the center of the headlight. The center of the headlight beam must be 2 inches (5 cm) below the intersection of lines(C) and (H).

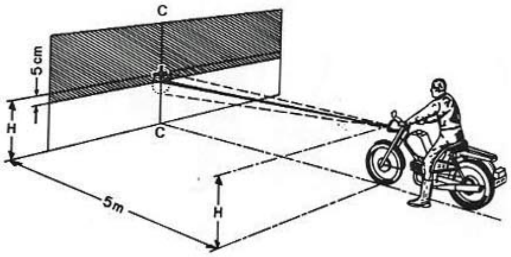


Figure 14

TROUBLE SHOOTING-FRAME AND FORK ASSEMBLY

SYMPTOM	REASON/S	REMEDY
Machine is unduly sensitive to road surface irregularities	Fork and/or rear suspension units damping ineffective	Check condition of springs in forks. Replace suspension units.
Machine rolls at low speeds	Steering head bearings over tight or damaged	Slacken bearing adjustment. If no improvement, dismantle and inspect head bearings
Machine tends to wander; steering is imprecise	Worn swinging arm suspension bearings	Check and if necessary replace pivot bolt and bushings
Forks shudder when front brake is applied	Worn bushings in fork assembly. Steering head bearings too slack	Strip forks and replace either lower fork tube or fork assembly. Replace steering head bearing as a unit
Wheels seem out of alignment	Frame distorted as result of accident. Rear wheel not tracking properly	Check frame after stripping out. If bent, replacement is necessary. Sight down drive sprockets for proper alignment, adjust if necessary

SECTION VI

WHEELS, HUBS, AND BRAKES

REAR WHEEL-BRAKES

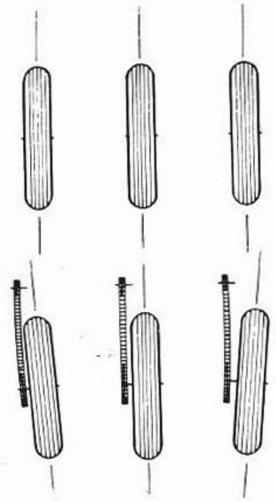


Figure 145

When installing a rear wheel make sure that both wheels are in alignment. Checking and adjusting is easily carried out in any workshop. The rear wheel is aligned by sighting from the rear (drive side) sprocket up to the engine sprocket. These two sprockets must fall within the same plane. Take two sightings down the chain to avoid error.

NOTE: Do not sight down the chain with the master link on top, as it tends to distort the reading.

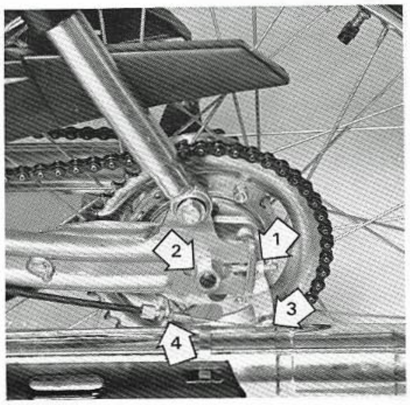


Figure 146

REAR WHEEL CHAIN ADJUSTMENT

When refitting the chains take care that the tension is correct and the connecting links are properly placed with the closed end pointing in the direction of chain travel.

The designed slackness of the driving chain midway between the sprockets should be ¾". (see figure 148)

Chain tension should be checked with laden weight. Loosen both axle nuts (figure 146/2). Adjust chain adjusters (figure 146/1) until chain tension is correct.

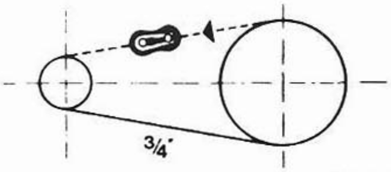


Figure 148

REAR BRAKE LEVER ADJUSTMENT

The position of the brake lever is particularly important for a properly working brake.

If fully actuated the brake lever position is to be max. 90 degrees. (see figure 147). Upon wear of the lining the lever position changes. Correct the lever position as long as the wear of linings still allows readjusting. If the lever position cannot be readjusted, the brake linings must be replaced. Readjust at the toothing between brake lever and brake cam.

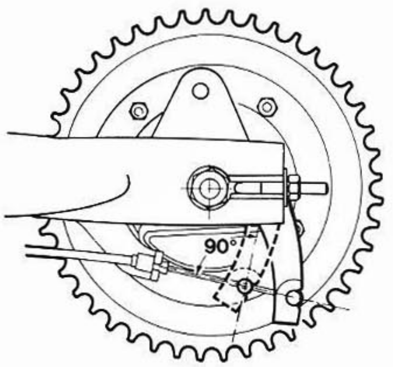


Figure 147

FRONT WHEEL - BRAKE SHOES

FRONT BRAKE SHOE INSPECTION

Disconnect brake cable from brake lever. Remove the plastic plugs from the inspection holes. Insert a flat feeler gauge between the brake drum and the brake shoes. The gap should not exceed .047 in. (1.2 mm) at either inspection hole. If it does, the brake linings must be replaced.

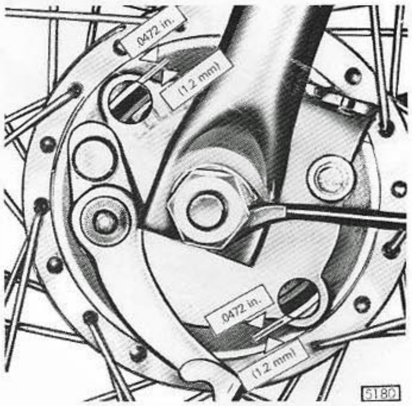


Figure 149

BRAKE SHOE REPLACEMENT

Glued-on linings are used on all brake shoes fitted to our machines. If linings are worn, replace complete shoes.

Front & Rear Brake drum diameter

New	Wear Limit
3.149 in.	3.188 in.
80 mm	81 mm

Front & Rear Diameter of fitted shoes

New	Wear Limit
3.110 - 3.129 in.	3.039 in.
79-79.5 mm	77.2 mm

Remove wheel. Remove brake shoes from hub. (see following page). Pry brake shoes away from brake cover with a screw driver and remove shoes and springs.

Roughen brake surfaces of brake drums with emery cloth prior to fitting new shoes.

Dirty oiled linings, usually due to over greasing of brake cam, must be cleaned with gasoline or a similar degreasant.

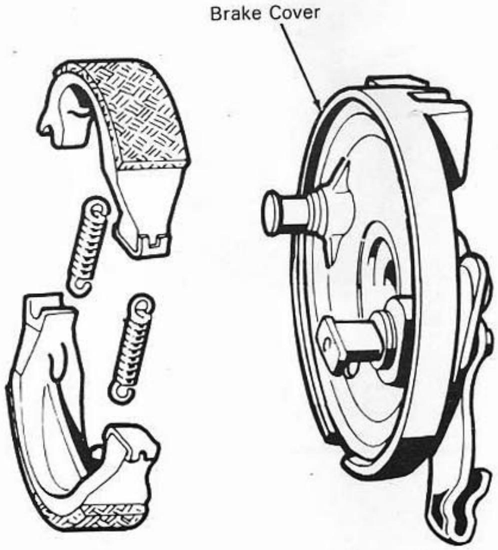


Figure 150

HUBS

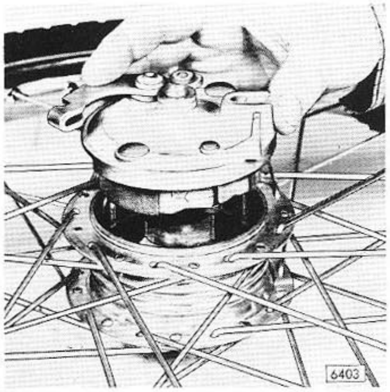


Figure 151

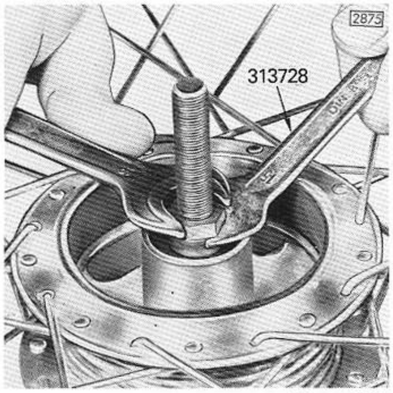


Figure 152

HUB BEARINGS

If hubs with decomposable bearings are worn, replace complete sets consisting of bearing rings, tapers and balls.

Hubs are greased for life. This means, that the original grease filling is sufficient for approximately 10000 km (6000 miles) use. After this, hubs must be dismantled, cleaned and regreased.

FRONT HUB (DISMANTLING)

Remove wheel from fork and mount axle in vise.

CAUTION: Use soft jaws in vise to prevent damage to axle.

Remove lock nut and lift brake plate assembly out of hub. Remove lock nut and bearing cone (Figure 152), using spanner (P/N 313728).

Remove hub from axle.

CAUTION: Ball bearings are not caged. Do not lose bearings. Inspect bearing cups and cones and replace if pitted or worn.

NOTE: Cups may be drifted out and new cups can be pressed in.

REAR HUB DISMANTLING

Follow the same dismantling procedure as on front wheel.

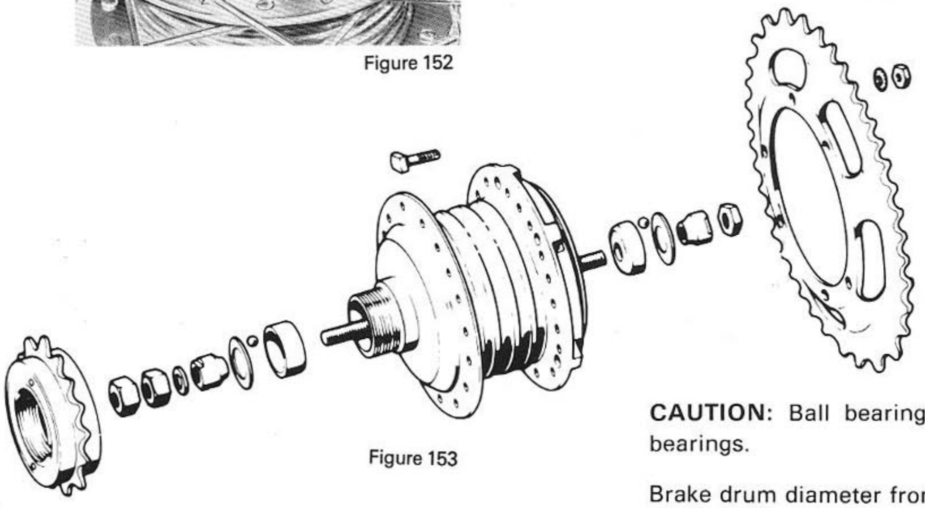


Figure 153

CAUTION: Ball bearings are not caged. Do not lose bearings.

Brake drum diameter front and rear

New	Wear Limit
3.149 in. (80 mm)	3.188 in. (81 mm)

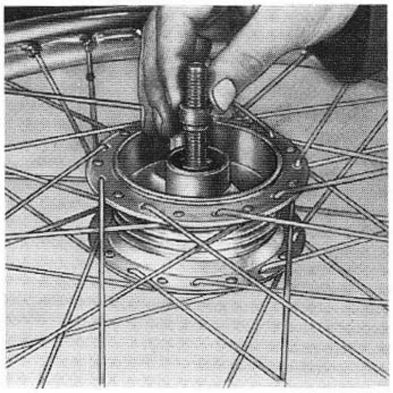


Figure 154

INSTALLING REAR HUB

Pack bearing cups with fibrous wheel bearing grease, fit ball bearings into place (11 per side) and reassemble hub on axle. Tighten bearing cone until axle movement is restricted, then turn cone ⅛-¼ back.

IDLER GEAR-DRIVE SPROCKET

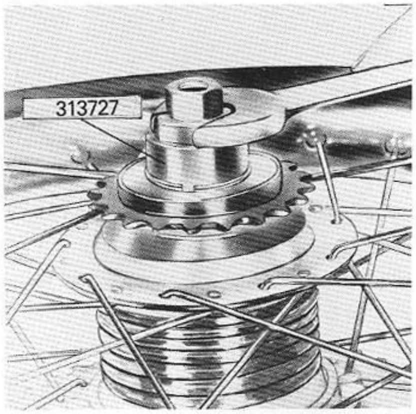


Figure 155

IDLER SPROCKET

It is not necessary to completely dismantle hub to replace idling drive sprocket. Unscrew complete sprocket with special tool (P/N 313727) and replace if required.

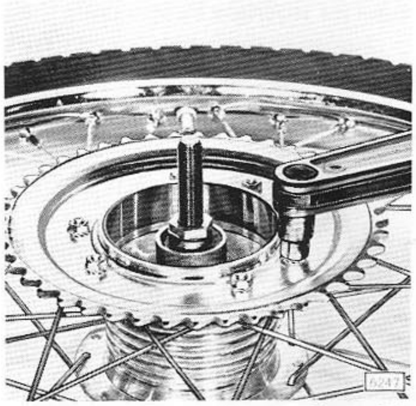


Figure 156

DRIVE SPROCKET

To replace drive sprocket remove mounting bolts. Remove sprocket and replace with new sprocket.

Torque nuts to 7 ft/lb (10 Nm).

TROUBLE SHOOTING-WHEELS, HUBS, AND BRAKES

SYMPTOM	REASON/S	REMEDY
Handlebars oscillate at low speeds	Buckle or flat in wheel rim, probably front wheel Tire not straight on rim	Check rim alignment by spinning wheel. Correct by retensioning spokes or having wheel rebuilt on new rim. Check tire alignment
Machine lacks power and accelerates poorly	Brakes binding	Check for warm brake drums. Readjust brakes.
Brakes grab when applied gently	Ends of brake shoes chamfered Elliptical brake drum	Chamfer with file. Lightly skim in lathe (specialist attention needed)
Brake pull-off sluggish	Brake cam binding in housing. Weak brake shoe springs	Free and grease Replace, if brake springs not displaced
arsh transmission	Worn or badly adjusted chains. Hooked or badly worn sprockets	Adjust or replace as necessary. Replace together as pair, chain as well

TRUEING WHEEL

TRUEING

Before turning any of the spoke nipples, let the air out of the tire. Failure to do this could cause damage to the rim strip and inner tube and could result in a punctured tube.

If a spoke wrench is used to turn the nipples, be certain that it fits snugly on the flats of the nipple. A spoke wrench (P/N 313730) is available. If no spoke wrench is available, remove the tire, tube, and rim strip from the wheel and use a screwdriver that fits the slot in the head of the nipple.

If a wheel has several loose spokes, tighten each loose spoke with only one turn of the nipple at a time until all spokes are uniformly tight. After tightening spokes, check the wheel for trueness by observing the side movement of the rim relative to the fork or frame tube while the wheel is turning.

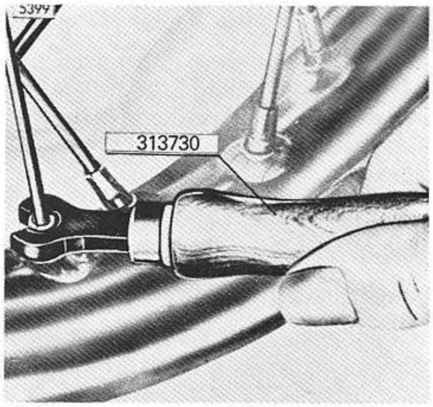


Figure 158

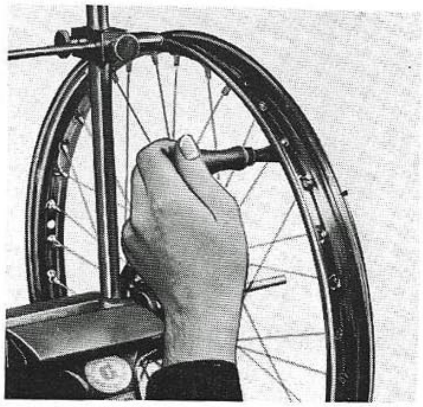


Figure 157

If a wheel has side-to-side runout (appears to move from side to side when spinning), tighten spokes one turn or less in groups of three or four on the side toward which you wish to move the rim. Recheck for runout after each adjustment and repeat the procedure until wheel runs true.

If a wheel is out of round, tighten spokes on both sides of the wheel where a high spot exists. Tighten the spokes one turn or less in groups of three to five. Recheck for roundness and repeat the procedure if necessary until the wheel is reasonably round. In some cases it may be necessary to loosen some spokes where a low spot exists to prevent over tightening of the spokes where a high spot exists.

After trueing remove all spoke ends extending beyond the nipple heads. Even fractionally protruding spokes will damage the tube. Therefore, any burrs must be filed or ground down. It is recommended that all respoked wheels be trued after a few hours' riding. Spokes often settle during the first few hours of operation.

CAUTION

Do not overtighten spokes as this may pull the wheel out of round. Replace any spokes and nipples which become broken or damaged.

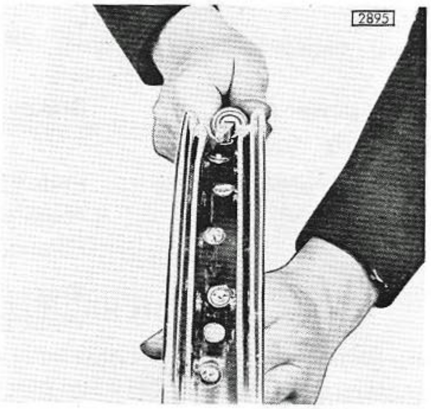


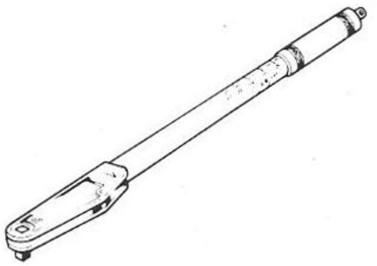
Figure 159

SECTION VII

TECHNICAL DATA

TORQUE READING

TORQUE INDICATING WRENCHES
AND
RECOMMENDATIONS FOR PROPER USAGE



WHY YOU SHOULD USE A TORQUE WRENCH

Manufacturers of mechanical equipment have determined by experience that better performance and longer life can be obtained by tightening certain bolts or groups of bolts to a uniform degree of tightness. Even an experienced mechanic cannot tighten a group of bolts, such as cylinder head bolts, evenly; but with a Torque Indicating Wrench, an unskilled apprentice can quickly and accurately tighten bolts uniformly to manufacturers' recommendation. Modern high compression engines and today's exacting manufacturing and repair standards demand accurate torque indicating tools.

WHAT IS TORQUE?

Torque is twist and is usually measured in foot pounds. For example: Imagine yourself pulling with a force of ten pounds at right angle to the handle of a wrench and at a distance of 1½ feet from a bolt being tightened. The torque or twist exerted would be ten pounds multiplied by 1½ feet or 15 foot pounds. Changing the distance of grip of the wrench, or changing the strength of pull, or changing the angle of pull, will change the torque applied.

EASY TO USE

The Torque Indicating Wrenches make all of the calculations instantly for you. Its simplified rugged construction uses a centerless ground alloy steel beam which accurately indicates on a clearly marked scale without any fragile or complicated mechanism. The slide marker over the scale can be set to the proper point and after that it is only necessary to watch the pointer and the marker which can easily be done from practically any position.

TORQUING HINTS

1. Always work on clean threads — rust and dirt will influence your reading.
2. If threads are oiled, reduce torque applied by 10%. For example: if you wish to pull 100 foot pounds, apply 90 foot pounds.
3. Never tighten a fastner completely with a wrench and then check the torque. Use the torque wrench in the final tightening stages.

The torque reading in foot pounds is the torque required to bring any given bolt to its maximum safe stress point.

Tension is the pressure in pounds per square inch (P.S.I.) that the bolt material can stand before stretching occurs.

For example—brass parts would determine the tension applied rather than the the bolts being used.

TORQUE SPECIFICATIONS

TIGHTENING SPECIFICATIONS

Engine unit

Cylinder head	7 ft/lb (10Nm)
Flywheel nut	25 ft/lb (35 Nm)
Clutch fixing nut	20 ft/lb (27 Nm)
Housing screws	6 ft/lb (8 Nm)
Housing cover screws	6 ft/lb (8 Nm)
Engine fixing screws	23 ft/lb (32 Nm)

Frame assembly

Front/rear axle nuts	20 ft/lb (27 Nm)
Rear suspension unit, top acorn nut	17 ft/lb (23 Nm)
Rear suspension unit, bottom hex nut	9 ft/lb (12 Nm)
Swing Arm bearing bolts	29 ft/lb (40 Nm)
Handlebar clamp screw	20 ft/lb (27 Nm)
Crank cotter nuts	5 ft/lb (7 Nm)
Front fork fixing screws (M8)	9 ft/lb (12 Nm)

Tightening torque to be within a tolerance of 10%

NOTE: Nm stands for Newton-meter which is an European standard measure. The conversion factor to ft/lb (foot-pounds) is 0.723.

ASSEMBLY TOLERANCES

CYLINDER					
SIZE	1	2	3	4	5
Inch	1.4950–1.4954	1.4954–1.4958	1.4958–1.4962	1.4962–1.4966	1.4966–1.4970
mm	37.975–37.985	37.985–37.995	37.995–38.005	38.005–38.015	38.015–38.025

Permissible ovality of the cylinder .00098 in. (0.025 mm)

PISTON					
SIZE	1	2	3	4	5
Inch	1.4938–1.4942	1.4942–1.4946	1.4946–1.4950	1.4950–1.4954	1.4954–1.4958
mm	37.945–37.955	37.955–37.965	37.965–37.975	37.975–37.985	37.985–37.995

Match only cylinders and pistons of equal tolerance

ASSEMBLY TOLERANCES		
Cylinder – piston	.0006– .0014 in.	0.015–0.035 mm
Piston ring groove clearance	.0012– .0028 in.	0.03 –0.07 mm
Piston ring gap clearance	.0059– .0118 in.	0.15 –0.30 mm
Big end bearing play	.0003– .0008 in.	0.008–0.020 mm
Clutch drum axial	.0039– .0078 in.	0.10 –0.20 mm
Clutch cover – starting clutch	.0181– .0197 in.	0.30 –0.50 mm

SORTING TABLE				
Wrist pin boss		Wrist pin		Clearance
Group	Diameter	Group	Diameter	
yellow	.4728– .4727 in.	2	.4726– .4724 in.	.0001– .0003 in.
	12.008–12.006 mm		12.003–12.000 mm	0.0030–0.0085 mm
blue	.4727– .4726 in.		.4726– .4724 in.	.0001– .0002 in.
			12.003–12.000 mm	0.0005–0.0060 mm
	12.006–12.003 mm	3	.4725– .4723 in.	.0001– .0003 in.
			12.000–11.997 mm	0.0035–0.0090 mm

RECOMMENDED SETTINGS		
Ignition timing	.051– .067 in. b. TDC	1.3–1.7 mm v. OT
Breaker point gap	.014– .018 in.	0.35–0.45 mm
Spark gap	.016– .020 in.	0.40–0.50 mm

METRIC CONVERSION TABLE

MILLIMETERS TO INCHES

mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
.01	.00039	.41	.01614	.81	.03189	21	.82677	61	2.40157
.02	.00079	.42	.01654	.82	.03228	22	.86614	62	2.44094
.03	.00118	.43	.01693	.83	.03268	23	.90551	63	2.48031
.04	.00157	.44	.01732	.84	.03307	24	.94488	64	2.51968
.05	.00197	.45	.01772	.85	.03346	25	.98425	65	2.55905
.06	.00236	.46	.01811	.86	.03386	26	1.02362	66	2.59842
.07	.00276	.47	.01850	.87	.03425	27	1.06299	67	2.63779
.08	.00315	.48	.01890	.88	.03465	28	1.10236	68	2.67716
.09	.00354	.49	.01929	.89	.03504	29	1.14173	69	2.71653
.10	.00394	.50	.01969	.90	.03533	30	1.18110	70	2.75590
.11	.00433	.51	.02008	.91	.03583	31	1.22047	71	2.79527
.12	.00472	.52	.02047	.92	.03622	32	1.25984	72	2.83464
.13	.00512	.53	.02087	.93	.03661	33	1.29921	73	2.87401
.14	.00551	.54	.02126	.94	.03701	34	1.33858	74	2.91338
.15	.00591	.55	.02165	.95	.03740	35	1.37795	75	2.95275
.16	.00630	.56	.02205	.96	.03780	36	1.41732	76	2.99212
.17	.00669	.57	.02244	.97	.03819	37	1.45669	77	3.03149
.18	.00709	.58	.02283	.98	.03858	38	1.49606	78	3.07088
.19	.00748	.59	.02323	.99	.03898	39	1.53543	79	3.11023
.20	.00787	.60	.02362	1.00	.03937	40	1.57480	80	3.14960
.21	.00827	.61	.02402	1	.03937	41	1.62417	81	3.18897
.22	.00866	.62	.02441	2	.07874	42	1.65354	82	3.22834
.23	.00906	.63	.02480	3	.11811	43	1.69291	83	3.26771
.24	.00945	.64	.02520	4	.15748	44	1.73228	84	3.30708
.25	.00984	.65	.02559	5	.19685	45	1.77165	85	3.34645
.26	.01024	.66	.02598	6	.23622	46	1.81102	86	3.38582
.27	.01063	.67	.02638	7	.27559	47	1.85039	87	3.42519
.28	.01102	.68	.02677	8	.31496	48	1.88976	88	3.46456
.29	.01142	.69	.02717	9	.35433	49	1.92913	89	3.50393
.30	.01181	.70	.02756	10	.39370	50	1.96850	90	3.54330
.31	.01220	.71	.02795	11	.43307	51	2.00787	91	3.58267
.32	.01260	.72	.02835	12	.47244	52	2.04724	92	3.62204
.33	.01299	.73	.02874	13	.51181	53	2.08661	93	3.66141
.34	.01339	.74	.02913	14	.55118	54	2.12598	94	3.70078
.35	.01378	.75	.02953	15	.59055	55	2.16535	95	3.74015
.36	.01417	.76	.02992	16	.62992	56	2.20472	96	3.77952
.37	.01457	.77	.03032	17	.66929	57	2.24409	97	3.81889
.38	.01496	.78	.03071	18	.70866	58	2.28346	98	3.85826
.39	.01535	.79	.03110	19	.74803	59	2.32283	99	3.89763
.40	.01575	.80	.03150	20	.78740	60	2.36220	100	3.93700

METRIC CONVERSION TABLE

METRIC TO AMERICAN CONVERSION TABLE

MULTIPLY	by	to obtain
(LINEAR)		
Millimeters (mm)	.03937	Inches
Millimeters (mm)	.00328	Feet
Centimeters (cm)	.3937	Inches
Centimeters (cm)	.0328	Feet
(DISTANCE)		
Meters (m)	39.37	Inches
Meters (m)	3.28	Feet
Kilometers (km)	3281	Feet
Kilometers (km)	.6214	Miles
(AREA)		
Square Centimeters (cm^2)	.155	Square Inches
Square Centimeters (cm^2)	.001076	Square Feet
Square Meters (m^2)	10.76	Square Feet
(VOLUME)		
Cubic Centimeters (cc)	.06102	Cubic Inches
Liters (l)	61.02	Cubic Inches
(LIQUID CAPACITY)		
Liters (l)	2.113	Pints
Liters (l)	1.057	Quarts
Liters (l)	.2642	Gallons
Cubic Centimeters (cc)	.0338	Fluid Ounces
U. S. Gallons	1.2	Imperial gals.
Imperial Gallons	277,274	cu. in.
(WEIGHT)		
Grams (gm)	.03527	Ounces
Kilograms (kg)	2.205	Pounds
(OTHER)		
Newton Meters (Nm)	.723	Foot Pounds (Ft. Lbs.)
Kilometers/Liters (km/l)	2.352	Miles/Gallon (mpg)
Metric Horsepower (ps)	1.014	Brake Horsepower (bhp)

AMERICAN TO METRIC CONVERSION TABLE

MULTIPLY	by	to obtain
(LINEAR)		
Inches (in.)	25.4	Millimeters
Inches (in.)	2.54	Centimeters
Feet (ft.)	304.8	Millimeters
Feet (ft.)	30.48	Centimeters
(DISTANCE)		
Inches (in.)	.0254	Meters
Feet (ft.)	.03048	Meters
Miles (mi.)	1.609	Kilometers
(AREA)		
Square Inches (in. 2)	6.452	Square Centim.
Square Feet (sq. ft.)	929	Square Centim.
(VOLUME)		
Cubic Inches (cu. in.)	16.39	Cubic Centim.
Cubic Inches (cu. in.)	.01639	Liters
(LIQUID CAPACITY)		
Pints (pt.)	.4732	Liters
Quarts (qt.)	.9463	Liters
Gallons (gal.)	3.785	Liters
Fluid Ounces (fl. oz.)	29.58	Cubic Centim.
U. S. Gallons	1.2	Imperial gals.
Imperial gallons	4.537	Liters
Imperial gallons	277.274	cu. in
(WEIGHT)		
Ounces (oz.)	28.35	Grams
Pounds (lb.)	.4536	Kilograms
(OTHER)		
Foot-Pounds (ft. lbs.)	1.383	Newton Meters (Nm)
Miles/Gallon (mgp)	.4252	Kilometers/Liter (km/l)
Brake Horsepower (bhp)	.9862	Metric Horsepower (ps)

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